IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, ex rel, W.A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA, et al.	)	
Plaintiffs,	)	
V.	)	No. 05-CV-329-GKF-SAJ
TYSON FOODS, INC., et al.,	)	
Defendants.	)	

REPORTER'S TRANSCRIPT OF PROCEEDINGS

FEBRUARY 19, 2008

PRELIMINARY INJUNCTION HEARING

VOLUME I

BEFORE THE HONORABLE GREGORY K. FRIZZELL, Judge

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PROCEEDINGS

February 19, 2008

THE COURT: Be seated, please.

THE CLERK: We're here in the matter of the Attorney General of the State of Oklahoma, et al, vs. Tyson Foods, Inc., et al, Case Number 05-CV-329-GKF. Would the parties please enter their appearance.

MR. BULLOCK: Louis Bullock for the State of Oklahoma.

MS. BURCH: Kelly Burch, State of Oklahoma.

MR. NANCE: Bob Nance for the State of Oklahoma.

MR. BAKER: Fred Baker for the State of Oklahoma.

MR. GARREN: Richard Garren, State of Oklahoma.

MR. PAGE: David Page, State of Oklahoma.

MR. EDMONDSON: Drew Edmondson, State of Oklahoma.

repeatedly. And then finally on the right-hand side I've listed the sources for this information.

Q. When we talk about the post contact latency, how does that relate to our finding people that have been made sick by being at the river?

A. It makes it much more difficult. And because of the location of the Illinois River and its recognition as a regional resource, I'm sure that you have people there on a regular basis from Kansas and Missouri and Oklahoma and Arkansas who go home when they're done. And it's very difficult to capture that with the kind of passive reporting systems that we have in place for reportable diseases at present.

Q. Now, I notice that you included both Salmonella and Campylobacter. In light of the fact that the sampling didn't turn up much of that, do you regard that as a legitimate inclusion in this chart?

A. I do.

Q. Why?

A. The literature is quite clear that both Campylobacter and Salmonella are extraordinarily commonly associated with poultry. And it's important to recognize that these have very similar kinds of effects, similar range of severity, similar types of infective dose, similar types of latency periods. So all of these are, again, being measured by the indicator

for a period of time on the order of months but, again, its significance to you is negligible.

Q. Okay. Let's go to 403, please. Now, first of all, Doctor, in terms of this contamination that you testified to in the river and waters of the Illinois River Watershed, do you have an opinion as to the cause of that contamination?

A. Yes, my belief, as we'll talk about later, that there are probably different places, perhaps contributions from other sources, but the majority of the impacts are coming from poultry. And there are a variety of reasons for that including a number of those that are listed on this sheet.

Q. Let's go through those. What does the first -- the technical literature, what are you talking about there?

A. Well, let me first say that last one tried to inadvertently place too much value on any one of these particular numbers. A scientist typically looks at things from a weight of evidence standpoint or reliance of evidence standpoint. Everything has importance, some have more importance than others. But you get to the bottom line in your conclusion by integrating several different lines of evidence. The first here is that the available and historical technical literature on characteristics of poultry waste, particularly bacterial, demonstrate the presence of E. coli, Salmonella and Campylobacter and the fecal indicator organisms in poultry waste. That is -- the literature is clear on that.

the recreational period is soon. Therefore, they're not separate in time and they have to be considered together, particularly given the rainfall, the 45 or so percent of rainfall that falls in the spring period.

Q. Do you have any issue with the persistence of bacteria in the environment?

A. Well, as we talked about a few moments ago, there are certain kinds of bacteria, particularly important infectious bacteria, that are relatively easily able to survive in the environment, certainly for periods of weeks or months. And that period can be extended dramatically by sequestration of sediment or by sequestration in larger pieces of fecal matter which subsequently break down as they're in the environment for a while. So it's true that bacteria are subjected to stresses, but bacteria aren't so bad at getting along with stresses. And so you have adaptive mechanisms, you have this viable but non culturable state which allows the bacteria to remain viable or remain alive, but not culturable. So I think there's a temporal problem there as well.

Q. Let's talk about groundwater wells. Let's put up 401. What is 401, Doctor?

A. 401 is, again, the base map of the Illinois River Watershed, both the Oklahoma portion and the Arkansas portion, which identifies the fact that there are over 1,700 wells in the Oklahoma portion of the IRW.

Q. Okay. And let's go to 400. What is Exhibit 400, Doctor?
A. 400 is a compendium of groundwater samples that were collected for which detectable bacterial concentrations were reported. There are three kinds of samples here, all of them indicating groundwater. The first is the geoprobe sample which is also known as a direct push sample which is a sample collected from the surface of groundwater without having to install a standard monitoring well.

The second are the red triangles which are springs representing that a spring is the first appearance of groundwater at the surface. And as Secretary Tolbert mentioned earlier today, springs do represent a drinking water source and have in the past in a number of locations. And then finally, the green triangles are the water wells indicating either domestic wells or installed wells that were sampled.

Q. Now, were there -- first of all, what is the standard by which -- we've talked about primary body contact. What is the standard by which groundwater is looked at?
A. The existing standard for groundwater is not present. That is no bacteria present. That's particularly true for E. coli, which is one of the measures of groundwater contamination. As a practical matter, you do occasionally find bacteria in wells as a result of surface activities. And these surface activities include the application of poultry litter to the kind of topography and geology here which you'll, I'm sure,

hear about later that doesn't filter things out very well.
Q. Now, are these all of the groundwater samples or what's the nature of the particular spring geoprobe or water well sample, why are these on here?
A. These are on here because bacteria were detected in these wells. These are wells for which bacteria were detected representing a potentially dangerous situation. And once again, it's not a situation where these values are one where the number was supposed to be zero. These number go as high as several thousand and represent, in my judgment anyway, a clear indication that there's impacts from the surface to the groundwater.
Q. Perhaps for the record, why don't you give us a little fuller explanation of what a geoprobe is.
A. Geoprobe is a small tubular device which is pushed from the surface to a depth that's determined -- previously determined. It prevents the necessity for drilling a well and then installing a casing and collecting a sample. It's becoming much more widely used in the environmental characterization field not only for chemicals but also for microorganisms as well.
THE COURT: How many wells are there here on this map that have detected bacterial contaminants?
THE WITNESS: There are between 50 and 60, maybe about 60.

Q. (By Mr. Bullock) Let's look at Exhibit 399. What is 3 -- I think I said -- yeah, 399.

A. 399 is a listing. There are six articles presented on here that are representative of the kinds of information that's out there and has been for at least, I guess the earliest one that's on here is 1980, so maybe getting on close to 30 years. And I've identified the title and the authors and I've selected some quotations out of these that I think indicate a relationship to what we've talked about so far.

Q. Okay. Are there any particular ones that you would call the Court's attention to?

A. Well, all of them. I think that the important part here to note if you just start at the first one is that Dry Poultry Manure Management is a document that was prepared by the University of Arkansas extension service, Dr. Bowls and his colleagues. And it identifies in the early '90's the fact that it is a potential pollutant of surface and groundwater if mishandled, referring to poultry waste in that article. The ultimate concern as identified by the authors here, once again, is to avoid bacterial contamination and excess nutrients in ground and surface water. Poultry producers must handle manure in ways that protect water resources. If improperly managed, poultry manure can become a liability rather than asset, causing problems in the environment and creating hazards to human and animal health. And then a listing of a couple of

ways in which manure can contaminate water.

Each of these has an important quote attributed to it and I've identified where those are located. I think each one of them clearly identifies the fact that it's recognized that the application of waste, if it's done, needs to be done in a very careful manner with recognition that fecal bacterial contamination is a clear and present danger from that process.

Q. Have you made an estimate as to the relative contribution within the IRW of common sources of fecal bacteria in the IRW?

A. Yes, I have.

Q. First of all, how did you go about making that estimate?

A. I used a procedure which is essentially the first few steps of the TMDL process, the total maximum daily load process that was described earlier, in which the bacterial source contribution is assessed, again for livestock, for septic tanks, for domestic pets, for sewage treatment plants or MPDS discharges. So there is a procedure applied, there are assumptions that are used by not only the State of Oklahoma but other states that all are required to do TMDLs. We've looked at Ohio's and Pennsylvania's and Florida's. They use similar assumptions with regard to bacterial loading, fecal loading, and it doesn't necessarily require, and, in fact, it doesn't require knowledge of the exact waste generation or mass of waste generation. What it requires is a knowledge of the number of animals and the area of the watershed that's being

affected and the land use of that watershed. So the TMDL process has developed a pathway to identify source contributions, and we applied that process.

Q. Okay. And what did you come up with when you did that calculation?

A. We identified the fact that poultry and cattle are both significant contributors from a purely numerical standpoint, but that swine are not, wastewater treatment plants are not, septic tanks are not, wildlife is not, pets are not. So you can go through that process and identify relative importance of these sources. As I mentioned earlier, at least as important, however, as the numerical contribution is the way in which that material reaches the ground and what happens to it once it reaches the ground which is what I believe professionally is what causes poultry waste to be much more important than some of the others that were discussed.

Q. Okay. So in terms of when you say that they're relative, the fecal bacteria from cattle and poultry are relatively the same, is that at the point where they go on the ground?

A. Yes, just the pure generation, not the what happens to it after it gets on the ground. That's where poultry begins to diverge from all the rest of these sources.

Q. So we're back to the cow patties don't float down the river, but the chicken litter easily floats?

A. Well, it easily floats, and it's also in a form -- in a

physical form which is much more easily leached. That is material that's in association with those particles can leave those particles and then move to other particles and eventually make its way to the surface water.

Q. Have you looked at, as part of your evaluation, at the records of reportable diseases in this area?

A. Yes, I have.

Q. And first of all, what are reportable diseases?

A. The State -- well, not only Oklahoma, but most states have a passive reportable disease system in place where either physicians or laboratories are obligated to report about 60 different kinds of diseases to the State as a record-keeping mechanism. When I say passive, the difficulty there is that it's somewhat self-regulating and it's at the mercy of people being busy. And it's at the mercy of the kinds of time delays that we mentioned earlier in terms of people's ability to assign a cause to a particular disease.

Q. Okay. Let's look at 398. What is that document?

A. This is a series of graphs from 1998 to 2005 looking at the rates of infection for Campylobacter in Adair County, Oklahoma, which is the county immediately west of the Oklahoma-Arkansas border and for which the Illinois River makes up the largest proportion of the county.

MR. TUCKER: Judge, I'd like to interpose an objection to that demonstrative exhibit because it's 2005 and this is

Q. Okay. Based on the materials that you have reviewed for this case as an expert in toxicology and risk assessment, do you have an opinion as to the role, if any, that land application of poultry waste in the IRW is playing as a source of bacterial contamination that you have identified within this watershed?

A. Yes, I think for all the reasons that I've talked about here, in my professional opinion, my toxicological and risk assessment opinion is there's a direct linkage between those and that it's representing a significant health concern that's ongoing.

Q. As an expert in toxicology and risk assessment, what is your opinion concerning allowing the existing practices of poultry waste disposal to continue?

A. I think what we know now and what we have learned indicates that that is an unwise practice that should be stopped.

Q. What is your opinion as to the degree of any risk associated with the continued application of poultry waste in this watershed?

A. I'm sorry, could you ask the question again?

Q. What is your opinion as to the degree of risk, if any, associated with the continued application of poultry waste in this watershed?

A. I think all of the data that I've reviewed and the

distribution and the time series of this bacterial contamination indicates to me it's a very significant risk.

Q. You understand what an imminent and substantial endangerment is?

A. Yes.

Q. And how does your opinion reflect in light of that?

A. Well, I believe that the imminent portion of that definition relates to closely in time, meaning that the problem needs to be resolved quickly, and I believe that is the case. I also think that the substantial portion is met by the magnitude and the frequency and the distribution of the exceedances that I've seen in the groundwater and the surface water.

Q. Doctor, when did you first form this opinion such that you could take it to state officials?

A. I would say I was involved in the case for a few months before I reached that opinion because I was reviewing data that was being provided to me. And candidly, I, at the outset, was a little skeptical for some of the reasons that, I think, other people are skeptical, but I am no longer skeptical.

Q. Well, you say that you're not skeptical now. When did you meet with state officials to inform them of the opinions which you have given here in this courtroom?

A. I met with representatives of the attorney general's office and Mr. Tolbert's office quite awhile ago, years ago.

IN THE UNITED STATES DISTRICT COURT

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Plaintiffs,	)	
V.	)	No. 05-CV-329-GKF-SAJ
TYSON FOODS, INC., et al.,	)	
Defendants.	)	

REPORTER'S TRANSCRIPT OF PROCEEDINGS

FEBRUARY 20, 2008

PRELIMINARY INJUNCTION HEARING

VOLUME II

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MR. GEORGE: He's not going to -- I just want to make sure that someone doesn't get up later, Your Honor, and say that Dr. Teaf has conducted the fate and transport analysis here.

THE COURT: I think we've plowed that ground.

MR. GEORGE: Okay. I'll pass the witness, Your Honor.

THE COURT: Mr. Bullock.

REDIRECT EXAMINATION

BY MR. BULLOCK:

Q. Just a few things. Dr. Teaf, yesterday Mr. Tucker presented some information concerning TMDLs in various watersheds, for instance the South Canadian?

A. Yes, sir.

Q. What does the information discovered in producing the TMDL for the South Canadian River tell you about sources of pollution in the Illinois River Watershed?

A. It tells you absolutely nothing and it would be dangerous to make assumptions between watersheds.

Q. Okay. Now, a great deal has been made about the issue of finding Campylobacter or Salmonella. Is it not -- can you not culture those organisms so that you can count them?

A. Under certain circumstances it's possible to do so but both of those organisms, and E. coli as well, are well-known to be stressed in the environment to the point that they are not culturable. They're not able to be tested in a lab or grown up

in the lab, but they're perfectly infective, the bacteria are alive and well. So it's an interesting problem. It's been identified in the literature many times. And it's a real public health dilemma because you can find illnesses and you can know that the bacteria are present in the water, but you can't find the bacteria in the water because of its viable, but nonculturable state.

Q. Now, also yesterday there was examination of -- do you recall the 2007 study that the EPA did concerning the use of the indicator bacteria?

A. Yes.

Q. What was the conclusion of that study as you understood it -- or that review?

A. That there are reasons to want to try to identify better ways to do this, but that at the present time there are not those ways. They are not available to us in a commercially applicable way that states can implement. No states have changed their positions as far as I know because of that draft report.

Q. Well, what is -- following that review, what changes were made in water quality standards in this nation?

A. None.

Q. If we take out the current water quality standards, if we eliminated them, if we didn't follow them, what would we have to guide us in terms of health risks in the water bodies of

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Defendants.	)	

REPORTER'S TRANSCRIPT OF PROCEEDINGS

MARCH 3, 2008

PRELIMINARY INJUNCTION HEARING

VOLUME V

BEFORE THE HONORABLE GREGORY K. FRIZZELL, Judge

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EXHIBIT
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water, air, odor, so there are social impacts for community members. This is not as great a problem for the Illinois River Watershed, but there are many parts of the country now where downwind of concentrated animal feeding operations, the air quality from the point of view of contaminants in the air as well as from the problem of intense odor has become widespread.

Q. And from where does that odor come?

A. Well, the odor is part --

MR. RYAN: Your Honor, I object. He said it doesn't apply to the IRW.

THE COURT: Sustained. We've all been to the panhandle, I believe. Go ahead.

THE WITNESS: Shall I answer it?

THE COURT: No, the objection is sustained. Go ahead.

Q. (By Mr. Edmondson) I'll rephrase the question. Is there bacteria in the litter of the poultry waste?

A. There are bacteria. There are other compounds, breakdown products of urine and feces, ammonia, hydrogen sulfide, nitrous oxide. It depends a little bit on the mix of what animal we're talking about as well as what kind of bedding or other organic material has been mixed in with the waste.

Q. Specific as to poultry waste, is there bacteria associated with poultry waste?

A. Yes.

Q. What nature of bacteria is associated with poultry waste?

A. Well, there are a broad range of organisms that have been isolated from poultry waste. Salmonella and Campylobacter species are among the more important human pathogens. E. coli, Enterococci, there are species of Coccidioides that is not infectious for humans, but is an important problem for growth of the bird. So Arsenicals, Roxarsone and other organic arsenic materials, are added to the poultry feed in order to reduce the Coccidioides to enhance the growth of the bird. There's also a Giardia species, again it's not the species that happens to affect the humans, but it's present in poultry waste.

Q. Don't most of these bacteria die at some point in time?

A. Eventually, but many of them can live for three or four months after being deposited by the bird.

Q. What factors determine the length of viability of these bacteria?

MR. RYAN: Your Honor, there's been no foundation for this question of this witness. I object.

THE COURT: Sustained.

Q. (By Mr. Edmondson) Are you able to state from the materials you reviewed or from your own knowledge and expertise whether these problems are present in the Illinois River Watershed?

A. Yes, from what I have read, the story is very remarkably similar to what I've directly observed on the eastern shore of

Enterococci and E. coli when using the geometric mean. And then in the right-hand part of the chart, there are a number of places where the single point estimates again show exceedances. Some of them are three times over the standard. One of them is 14 times over the standard, five over the standard. These all indicate significant bacterial contamination of the Illinois River Watershed.

Q. And in your opinion, do these exceedances have ramifications as to human health?

A. They have important ramifications. Based on the epidemiologic data we've been talking about, I would expect there to have been a significant number of people coming down with gastrointestinal disease as a result of exposure to recreational use of these waters.

Q. How would gastrointestinal disease manifest?

A. Well, the incubation time for the common forms, Salmonella, Campylobacter, vary a little bit. But usually three to seven or eight days after exposure to the source of bacteria, a person would develop fever, nausea, vomiting, diarrhea. And in a small subset of that population, they might go on to much more serious illness including bloody diarrhea. And in the case of enteropathogenic E. coli, they might develop what is called the hemolytic uremic syndrome which can actually cause death.

Q. Dr. Lawrence, let me invite your attention first to

you received from Plaintiffs' experts and affidavits?
A. Yes, they do.
Q. Dr. Lawrence, the data that you've just reviewed and the exceedances you've just described, what import, if any, do they have for people who use the Illinois River Watershed?
A. Well, I would hope that people would be informed of the considerable risk that they are undertaking by exposing themselves to waters that contain these levels of indicator bacteria for human pathogens. I think it represents a real and present danger to the health of the public, people who are exposed to these waters, and I would be highly motivated as a public health person to do whatever I could to reduce the risk.
Q. Now, there's an affidavit you reviewed from Dr. Banner?
A. Yes.
Q. He suggested that the risks that the State describes are not valid. Do you have an opinion as to Dr. Banner's opinion?
A. Dr. Banner appears to base his opinion on -- I haven't seen cases of diarrheal disease coming from the Illinois River Watershed. And I would say that that is probably the weakest kind of scientific evidence you could have, knowing what we do about the pathophysiology of these diseases, knowing about the problems associated with passive surveillance, which is how we rely on reporting cases to the state health department and to the CDC. And that based on the soundness of the EPA's epidemiologic data, we can only say that he must be missing a

lot of cases. People either are self medicating or they are attributing their diarrheal disease to the egg salad sandwich they ate yesterday rather than swimming in the Illinois River five days ago.

Q. Does everyone who gets gastroenteritis go to a doctor and get a lab test?

A. No, a very, very small proportion. Most people self medicate.

Q. What is a dose-response curve?

A. A dose-response curve is used throughout human biology. It's used to determine the efficacy of pharmaceutical agents. It's used to measure the risk of disease in exposure to varying levels of toxins. So it applies to bacteria. It applies to heavy metal exposures. It applies to cigarette smoke and it applies to the kind of medications that we take to treat human disease. The higher the dose, the more the response and you plot out multiple doses and multiple responses and calculate a dose-response curve.

Q. Is there a relationship between the levels of exposure and the probability or incidence of disease?

A. Yes, and that's, in fact, why we go through the work of developing dose-response curves. It's also, in epidemiologic studies, used as one of the criteria for satisfying the validity of the hypothesis that you put forward. In other words, if you find that twice as many people come down with a

certain range of symptoms when exposed to twice as much of the offending agent and that four times as many people come down with exposure with four times the offending agent, and you can demonstrate that dose-response relationship. It is also used as a tool of determining the truth of the given situation.

Q. Doctor, can you tell me, please, what indicator bacteria are?

A. Indicator bacteria are fellow travelers with pathogens. They are found in mixed bacterial flora from humans and animals. And they have characteristics that allow them to be tested for more reliably and more easily so that they may be viable and culturable when the pathogens that are traveling with them are dormant, still capable of causing disease, but not easily culturable.

Q. If we're interested in whether or not Salmonella is in a material, why don't we just test for Salmonella?

A. Salmonella in water systems is difficult to recover because of the phenomenon I just referred to of it being non-culturable, but still viable. There are other bacteria that are important pathogens that may require more difficult and more expensive testing devices. So it's a bit of a tradeoff from a public health perspective between having a reliable, easily cultured, easily quantified bacteria such as Enterococcus or E. coli versus bacteria that have been shown in scientific studies to be present, but not as easily cultured.

Q. The same question as to Campylobacter, why don't we just test for it?

A. Because Campylobacter, an important human pathogen arising from poultry waste, is similarly very difficult to culture in water, but it remains viable. You'd have to use very expensive and elaborate laboratory testing procedures to do that which would not be practical from a public health surveillance and monitoring perspective.

Q. Does the presence of indicator bacteria necessarily mean that there's a risk to human health?

A. It means a very high probability of risk in excess, in my opinion, of 99 percent. So it's a very useful and reliable, predictable way of saying whether or not somebody is going to be exposed to a hazard.

THE COURT: Doctor, quickly, what's the typical incubation period, if you will, for gastroenteritis? It may vary by bacteria?

THE WITNESS: It varies.

THE COURT: The state of the bacteria?

THE WITNESS: It varies by the species of bacteria, so that Salmonella, E. coli, Enterococci all have slightly different things. And then within a given bacteria, there may be a range, so that one person exposed to the same bug might be sick in three days and somebody else might take ten days to get sick.

treated with chemotherapy whose immune systems will not be robust, who will not be able to manage even modest doses of pathogens. We have young children and increasingly more of us are living into an older age where our immune systems again are less robust. And finally, we're in the midst of a global HIV, AIDS pandemic and we have many HIV positive people in the United States who are also immunocompromised. So I think what Dr. DuPont said is really irresponsible from a public health perspective.

Q. As a person in public health, Doctor, would you ever consider telling someone whose well is contaminated that if they just keep drinking it long enough, they'll be okay?

A. And just tough it out, I think that would be a very dangerous thing to do.

Q. And if that person had developed an immunity, would that translate to someone who might be visiting from another city?

A. Unfortunately it would not.

Q. Doctor, let me invite your attention to State's Exhibit 404. Could you tell me, please, if you know what that is?

A. This is a summary chart of waterborne bacterial illnesses including the timing and symptoms and is a clearer way of presenting the information than by verbal response to His Honor's inquiry a few minutes ago.

Q. Does that have the information the Court was inquiring about as to post contact latency?

A. Yes, it does. It shows that for E. coli the latency can range from one to seven days. For Salmonella, it's shorter, one to three days. And for Campylobacter, it's two to five days.

Q. Does it also purport to show the reported symptoms caused by each of those pathogens?

A. Yes, and the symptoms for all three of these major human pathogens are pathogens to humans, I should say. They are pathogens derived from both animal and human sources, but the symptoms include gastroenteritis, nausea, vomiting, watery and/or bloody diarrhea, abdominal cramping, dehydration, kidney failure in the case of E. coli. And then for Salmonella and Campylobacter, the same basic underlying gastroenteritis symptoms of nausea, vomiting, diarrhea. And significantly the infections can involve organ systems outside of the GI tract. For example, Campylobacter has been implicated in arthritis and in Guillain-Barre syndrome.

Q. Now, Dr. Lawrence, based upon your education, expertise and experience and based upon all of the materials that you've reviewed by both the State and the defendants, do you have an opinion as to whether the surface application of poultry waste within the Illinois River Watershed poses an imminent and substantial endangerment to the health or the environment of that watershed?

MR. RYAN: Your Honor, I object. There's been no

We're outside the scope of his affidavit. And I don't know where this is leading, but it certainly hasn't been revealed.

THE COURT: All right. Without going back and reviewing the affidavit at this point, any response?

MR. EDMONDSON: Your Honor, I'd be pleased if the witness would answer the question that I asked him that Your Honor overruled the objection on.

THE COURT: Very well. The objection is sustained. If you'll reask the question.

Q. (By Mr. Edmondson) Dr. Lawrence, do you have an opinion based upon your own knowledge and expertise, based upon the review of the affidavits of the State's experts as to whether the surface application of poultry litter within the Illinois River Watershed poses an imminent and substantial endangerment to public health?

A. Yes, I do and I believe it does.

Q. And do you hold that opinion to a reasonable degree of medical certainty?

A. Yes.

Q. Do you have an opinion as to whether a moratorium on the land application of poultry waste would have a remedial effect on that threat to public health?

A. Yes, it would not totally eliminate the problem, but it would dramatically reduce the threat.

MR. EDMONDSON: Thank you. Pass the witness, Your

cancer, was that an epidemiological study?

A. Smoking and cancer is a very good example of exactly the kind of case control studies that were used to establish the EPA water guidelines. And not everybody who smokes will get lung cancer, but the overwhelming number of people who have lung cancer will have been smokers. The first three large studies that demonstrated that fact were case control studies of exactly the kind that have been used to develop the indicator bacteria E. coli and Enterococci.

Q. There was some discussion about the existence of other impaired streams in Oklahoma and the suggested source of that impairment. Tell me, Doctor, in order to have a public health problem, what besides the impairment would be necessarily present?

A. You have to have exposure. So you can have an impairment without human exposure to the contaminated water and you would not see any disease.

Q. So would the degree to which the Illinois River Watershed is used for recreational activities be important to that connection?

A. That's a critically important piece of this entire case.

Q. And, Doctor, you testified in Cross-Examination that -- about passive reporting only revealing, I think you said fewer than one out of a hundred actual cases?

A. Yes.

Q. Why is that?
A. We know that most people, when they come down with the symptoms of gastroenteritis, will attribute it to the most recent experience they've had. So if I develop nausea and vomiting this evening, I would be more likely to attribute it to something I ate yesterday rather than to having been swimming five days ago.
Q. For it to be a reported case at all, what would be necessary?
A. The person would have to be sufficiently ill, that usually it's his spouse would say you've got to see your doctor. And then if the doctor would treat empirically and would not take a stool culture, would probably not even question the patient about where they might have been exposed, perhaps beyond saying is anybody else in the family sick. Only then, if the patient persisted and did not respond to empirical therapy or got worse, might the doctor either consult with an infectious disease specialist like Dr. DuPont or to obtain a stool specimen and send it to the hospital laboratory to find out what organism is responsible for the illness.
Q. So do some of those reports come from laboratories?
A. Yes.
Q. Okay. So if the reported cases reflect the one out of a hundred, then if there were six cases reported of Salmonellosis in Adair County in 2007, that would reflect 600 actual

illnesses?

A. That's a very reasonable extrapolation, yes.

Q. And if there were ten reported cases of Salmonello -- whatever that word is, in 2007 in Cherokee County, that would reflect a thousand actual illnesses?

A. A thousand highly probable illnesses.

Q. And as to Campylobacteriosis in Adair County, if there were six reported cases, that would reflect 600 actual illnesses?

A. Most likely, yes.

Q. And if there were six reported cases in Cherokee, that would reflect another 600?

A. Yes.

MR. EDMONDSON: That's all, Your Honor.

MR. BULLOCK: Just a second.

THE COURT: Yes, sir.

Q. (By Mr. Edmondson) Doctor, in answer to a question on cross-examination, you started to explain why the distribution of cattle manure is important and time and space. Could you please amplify on that?

A. Yes, if you have cattle on a grass fed pasture situation and they're out on pasture 365 days a year, they're moving about the pasture, looking for grass that hasn't been grazed, defecating in a relatively uniform manner across the pasture at a consistent rate over 365 days, that is a very different

IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, ex rel, W.A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA, et al.	)	
Plaintiffs,	)	
V.	)	No. 05-CV-329-GKF-SAJ
TYSON FOODS, INC., et al.,	)	
Defendants.	)	

REPORTER'S TRANSCRIPT OF PROCEEDINGS

FEBRUARY 21, 2008

PRELIMINARY INJUNCTION HEARING

VOLUME III

BEFORE THE HONORABLE GREGORY K. FRIZZELL, Judge

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EXHIBIT 37

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February 21, 2008

THE COURT: Mr. Bullock, Mr. George, and Ms. Southerland and I spoke a second ago outside the courtroom with regard to evidentiary matters. We've been going at such a rapid pace and because there has been an agreement with regard to exhibits on direct, there have been promises made to the Court with respect to exhibits that have been used on cross that they would be handled at the next break or at lunch that has not been done. So the concern is that going forward, we need to handle this matter very quickly or it presents real

A. Yes, we use the fecal indicator bacteria as a tracer or a surrogate to indicate the risk of the presence of human pathogens and thus the increased risk to human health from exposure to that water.

Q. Now, is it true that some pathogens that are in fecal material can be alive but not be culturable?

A. That's correct. The -- I guess the century old methodology for measuring bacterial concentrations is to culture them on some sort of an auger medium. We've known in the last 20 years or so that many organisms, when they're excreted from their host and they get out into the environment, may not die off, but they may become -- they may die off, but they may also become stressed, physiologically stressed, in which case they can no longer grow on the media that we normally use to culture them or detect them.

And so many studies have shown that when these bacteria become viable, we call this the viable but non-culturable phenomenon. They still have indications of metabolism and of the ability to sustain themselves. They can also be resuscitated or revived and start growing again when they get into a host, so when they get back into an environment that is conducive to their growth. So in spite of the fact that we cannot culture them and detect them, they still are potentially dangerous. And this is known in microbiology as the viable but non-culturable phenomenon. It's been seen in

so drying out. And again, it's very hard to say, it depends on a lot of common conditions that the bacteria encounter. If they are exposed fully to ultraviolet radiation and desiccated, it may take only a matter of hours for them to be permanently inactivated or killed. On the other hand, if they're shielded from radiation, if they're provided with some moisture, then they may persist for up to months at a time.

THE COURT: Thank you. Mr. Page.

MR. PAGE: Thank you, Your Honor.

Q. (By Mr. Page) So those bacteria can remain viable for months at a time if they have certain environmental conditions available?

A. That's correct.

Q. At the same time, if you use a standard method to try to identify that bacteria in the environment, it wouldn't necessarily be culturable?

A. That's correct, because the bacteria may be surviving and persisting in the environment, but they may be stressed to the point where they won't grow on this basically artificial growth substrate that we're providing them.

Q. Now, if a pathogen such as Campylobacter goes into this viable but not culturable state, can it then also remain as a hazard to human health?

A. Yes, studies have shown that viable but non-culturable organisms, when passed into a host such as perhaps if they were

Mr. Page.

MR. PAGE: Thank you, Your Honor.

Q. (By Mr. Page) Dr. Harwood, back to Exhibit 433. This is simply a summary of Oklahoma and U.S. EPA standards as they apply to recreational water quality uses; correct?

A. That is correct.

Q. That's bathing, swimming, splashing in the water; correct?

A. Right, correct.

Q. And I want to make sure this is clear. If someone is in water, bathing or swimming or splashing in the water, and the bacteria, any of those three bacteria, are at or above those levels, what does the EPA say about the expected sickness rate?

A. The EPA's guidelines and epidemiology studies and other epidemiology show that there is an increased risk of illness as levels above those standards rise. And the specific illness upon which most of these studies are based is gastroenteritis, so vomiting, diarrhea, nausea, cramps.

Q. How many people will get sick?

A. If the standards are right at that level, that's expected to be 8 individuals per thousand recreational water users and then it will go up from there. For example, if the E. coli concentrations increase about tenfold from this standard, then it's expected that the chance of getting ill will double.

Q. Thank you, Doctor. Now I'd like to turn your attention to State's Exhibit 434. Again, we have a blow-up on the tripod

consider high risk. And for example, poultry feces contain -- are known to very frequently contain Salmonella and Campylobacter. These are so-called zoonotic pathogens which means that they're inhabitants of the animal gastrointestinal tract but they cause disease in humans. And in fact, Campylobacteriosis and Salmonellosis are among the most prevalent of both waterborne and foodborne diseases.

Q. Both Campylobacter and Salmonella, are they both present in poultry waste?

A. Yes, they are.

Q. What about E. coli, is that also a zoonotic bacteria?

A. Well, the pathogenic forms of E. coli are, such as E. coli 0157:H7R, yes, zoonotic forms as well.

Q. I'd like now to draw your attention to State's Exhibit 437. Dr. Harwood, could you identify this exhibit for the Court, please?

A. Yes, this exhibit is a graph that was prepared from data that was collected in the IRW from 2005 to 2007. And it shows the relationship between E. coli concentrations on the vertical axis and fecal coliform concentrations on the horizontal axis. And what this graph shows is that he relationship between fecal coliforms and E. coli in the vast majority of the IRW samples is nearly equivalent and very linear with a slope of about one. And so these are highly correlated. And with this sort of information then, we can feel comfortable about applying the

Q. Doctor, I want to now refer you to an exhibit that Dr. Teaf referred to a couple of days ago, State's Exhibit 406. Would you please remind us what information is shown on Exhibit 406?

A. This is a map of the Illinois River Watershed. And these various color segments are those that have been designated impaired due to high indicator bacteria levels by the State of Oklahoma. At each of the dots are public access site points along tributaries in the Illinois River itself. And the red dots indicate sites where water quality standards were exceeded by indicator bacteria. So showing that, in fact, people who are using the water, they're putting in at these public access points for, as Dr. Caneday explained, for floating, swimming, canoeing, these people are being exposed to these elevated levels of indicator bacteria and thus at increased risk for illness.

Q. Now, does this information have any importance to you as a microbiologist with regard to evaluating the health risks associated with the Illinois River?

A. Yes, because we know that -- since we know -- so these aren't small ditches that nobody goes in, this is a scenic river. It is used -- it's an Oklahoma scenic river. It's widely used for recreation as was mentioned before. We know that literally thousands of people are being exposed to these high levels of bacteria and the increased health risk that's

represented by them.
Q. Thank you, Doctor. I want to switch gears on you a little bit again. Do you have an opinion with respect to the source of bacteria that has impaired the IRW?
A. Yes, I believe that a significant portion of that is contributed by land applied poultry litter.
Q. And do you have an opinion as to what would happen if poultry waste land application was stopped in the IRW?
A. Yes, I believe that over time the levels of bacteria would decline and that the human health risk would be decreased.
Q. Okay. Do you have any specific evidence, Doctor, that contribution of poultry litter to lands in the IRW has contaminated the waters of the IRW?
A. Yes, we used a reliable method called polymerase chain reaction or PCR to develop a poultry litter specific biomarker which we use as a tracer to follow the pathway of poultry -- of microbial contamination from poultry litter throughout the Illinois River Watershed.
Q. Would you just define briefly what a biomarker is?
A. A biomarker would be a biological component of some organism. In this case it's a bacterium and in this case the biological component is a gene fragment that we were able to detect by PCR and this bacterium is highly associated with chicken -- with contaminated chicken litter.
Q. Doctor, are there differences between the PCR method of

have the questions of fate and transport through the watershed. And we also have the question of there are things that we don't know about the relative rates of transport of pathogens compared to indicator bacteria and indicator bacteria and pathogens compared to the biomarker. So just because we don't detect it doesn't mean that there was never any poultry contamination there.

Q. Does the biomarker have a different life span in the environment than, for example, a chemical?

A. Well, a chemical might be expected to persist indefinitely until it gets used through biogeochemical cycling but because bacteria are biological organisms, they have a certain amount of persistence time in the environment, so they will not persist indefinitely over time.

Q. What type of samples were analyzed with the PCR method?

A. We analyze poultry litter samples. We analyze land applied soil samples or soil samples which received land application of poultry litter. We amplified edge of field samples which are basically direct runoff from fields that had received land application of poultry litter. Surface water samples, including Illinois River samples and tributary samples. And groundwater samples, including geoprobe samples and well samples, and also spring samples.

Q. From the samples you analyzed for litter, what were the results with the PCR marker?

A. All of the litter samples were positive for the biomarker, quantifiable with levels of biomarker over -- up to over a billion copies per gram.

Q. What about the land applied field samples, what were the biomarker results for that?

A. The land applied field samples were about 90 percent positive for the biomarker. And the maximum, around the maximum value for that was 10 million copies per gram.

Q. And what about edge of field, the next step in the path, what about those for biomarker?

A. Edge of field samples, about 50 percent positive and a maximum value of about 10 million per liter.

Q. And the same --

THE COURT: Doctor -- excuse me just a second, Mr. Page. You say you worked with Dr. Olsen with regard to sampling strategy and collection. To the uninitiated such as myself, the first question that jumps to mind as I tried to superimpose the location of the poultry houses to this map is that when we're talking about the area of recreational activity, there don't seem to be as many sampling stations, but rather that sampling is occurring in the area where these poultry houses are located and which raises fate and transport issues. I mean, to the extent that we are really focused here in this case about the public health concerns, it implicates fate and transport of these bacterium from the areas of highest

poultry house location.

Why is it that you and Dr. Olsen didn't select more? I see that you have some green RNA results down here in the area just above Lake Tenkiller showing detectable, but not quantifiable. To the extent that we're focusing here to some extent on recreational activity and the public health repercussions or impact, why is it that you and Dr. Olsen didn't pick those locations as opposed to the locations closer to the poultry houses?

THE WITNESS: That would be -- when we were planning the sampling strategy, the focus was to find the pathway that would start basically at the poultry litter -- or find if there was a pathway that would start at the poultry litter houses and proceed --

THE COURT: From a scientific point of view.

THE WITNESS: Right.

THE COURT: I understand completely, sure.

THE WITNESS: Right. And then so, yeah, and I have to admit that, in fact, if I had looked at this map a couple of months ago, I wouldn't even have known where the important recreational water bodies were. It wasn't something that -- demonstrating that hypothesis in particular wasn't the focus.

THE COURT: You're trying to make the link?

THE WITNESS: Yes, exactly.

THE COURT: Right, I understand. Go ahead, Mr. Page.

MR. PAGE: Thank you, Your Honor.

Q. (By Mr. Page) Did you detect the biomarker in surface water samples?

A. Yes, we did. We detected the biomarker in 43 and a half percent or so of surface samples at levels up to 100,000 per liter.

Q. What about groundwater samples?

A. We did detect it in some groundwater samples, two groundwater samples to be exact, and at a level up to 20,000 per liter. And two out of 22 samples would be 9 percent.

Q. Now, a similar question to what the Judge just asked you. What does this information tell you, if anything, with regard to the distribution or pathway of poultry waste bacteria in the IRW?

A. Well, it demonstrates that the bacteria are following the pathway or that they have a transport pathway from the fields to the surface waters and also into the substratum into that karst, that fractured karst substratum which then allows them to appear in the groundwater and then be transported back upward into the spring systems.

Q. Let me draw your attention or if you would, to sample marked LAL5A on this exhibit. Can you identify that location for the Court, please?

A. Yeah, I think so. LAL5A is right about here. That's a soil sample and from a land applied field. That one had 4

Q. Does that mean the poultry waste biomarker co-varies with the indicator bacteria?

A. Correct.

Q. What is the chance of, let's say, a mistake in this analysis?

A. That would be, again, it's P less than .0001, so less than one in a thousand that this relationship occurred by chance.

Q. Now, Dr. Harwood, earlier I believe you stated an opinion concerning the importance of poultry waste as a contaminant, a bacterial contaminant in the IRW?

A. Correct.

Q. Would you please restate that opinion?

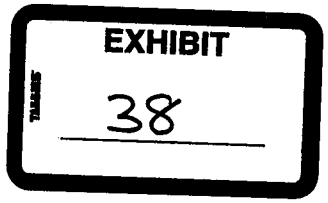
A. Yes, my opinion is that the poultry waste -- land application of poultry waste in the IRW is a major contributor to elevated indicator bacteria loads in the Illinois River Watershed in these waters.

Q. Now, what evidence did you use to reach this conclusion?

A. I used the weight of evidence approach which is what typically one does when investigating ecological questions. So rather than relying on one line of investigation, integrated numerous lines. So that would be starting out with -- and not in any particular order. But since we're talking about it, the widespread and quantifiable presence of the poultry litter biomarker and the evident pathway in terms of its concentration gradient from the litter to the fields to the edge of the field

WATERBORNE BACTERIAL ILLNESS: TIMING & SYMPTOMS

Bacterial Group	Reported Symptoms	Post-Contact Latency	Symptom Duration	Infective Dose	Sensitive Populations	Antibiotic Resistance Described	Sources
E. coli (including 0157:H7)	Gastroenteritis, nausea, vomiting, watery/bloody diarrhea, abdominal cramping, dehydration, kidney failure (HUS), death	1 to 7 days	up to 8 days	very low (~10 organisms)	Yes	Yes	Centers for Disease Control Mayo Clinic U.S. Food & Drug Administration U.S. EPA
Salmonella sp.	Gastroenteritis, nausea, vomiting, diarrhea, abdominal cramping, dehydration,fever, liver/spleen enlargement, accelerated heartrate, headache, mental confusion, sepsis, brain/spinal infection, death	1 to 3 days	4 to 14 days	moderate	Yes	Yes	Centers for Disease Control Mayo Clinic World Health Organization U.S. EPA
Campylobacter sp.	Gastroenteritis, nausea, vomiting, watery/bloody diarrhea, abdominal cramping, dehydration, fever, headache, sepsis, kidney failure (HUS), reactive arthritis, Guillain-Barre syndrome, death	2 to 5 days	3 to 10 days (recurrence rate ~25%)	very low (~500 organisms)	Yes	Yes	Centers for Disease Control U.S. Food & Drug Administration World Health Organization U.S. EPA



IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, ex rel, W.A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA, et al.	)	
Plaintiffs,	)	
V.	)	No. 05-CV-329-GKF-SAJ
TYSON FOODS, INC., et al.,	)	
Defendants.	)	

REPORTER'S TRANSCRIPT OF PROCEEDINGS

FEBRUARY 20, 2008

PRELIMINARY INJUNCTION HEARING

VOLUME II

BEFORE THE HONORABLE GREGORY K. FRIZZELL, Judge

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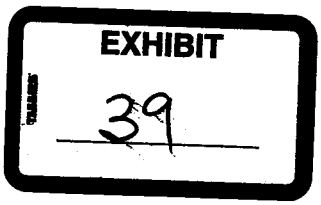
UNITED STATES COURT REPORTER



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PROCEEDINGS

February 20, 2008

MR. JORGENSEN: Good morning, Your Honor.

THE COURT: Good morning, Mr. Jorgensen.

MR. JORGENSEN: May I start with a housekeeping matter?

THE COURT: You may, sir.

MR. JORGENSEN: When you get sued, it's the usual thing to come to court on hearing day, but the company Willow Brook asked if I would say to you that they're not here.

THE COURT: We got the notice. The notice that they

please.

THE WITNESS: Gordon Vernon Johnson.

THE COURT: Mr. Nance, you may inquire.

MR. NANCE: Thank you, Your Honor.

DIRECT EXAMINATION

BY MR. NANCE:

Q. You've told the Court your name. Would you tell the Court what you have done in your professional career, particularly at the Oklahoma State University?

A. I served as extension soil nutrient management specialist and director of the soil, water and forage testing laboratory.

Q. And for what period of time were you at Oklahoma State University?

A. I was there from 1977 through 2004.

Q. Were you, at least in 2003 and '4, the regent's professor of soil science at the university?

A. Yes.

Q. Let me ask you to look at Exhibit No. 84 and ask if that is your curriculum vitae current through March of 2003?

A. Yes.

Q. And other than the fact of your retirement in 2004, is there any change that needs to be made to that?

A. No.

Q. Have you testified as an expert witness in court cases before?

Dr. Johnson, what is the approximate ratio of nitrogen to phosphorus in poultry litter?

A. It's approximately one to one for nitrogen and P205 phosphorus.

Q. Okay. Thinking particularly about Bermuda grass and fescue, what's the ratio of the need for nitrogen to phosphorus in those two grasses?

A. Well, we can't identify the need without the soil test, but the ratio of nitrogen to phosphorus in the plant material is about eight to one.

Q. So if poultry waste is applied to meet the phosphorus -- excuse me -- the nitrogen need of those crops, would you be applying more or less phosphorus than is needed?

A. You would be applying several times more phosphorus than would be needed in the plant.

Q. All right. Can poultry waste or poultry litter be custom blended to meet the specific nutrient needs of particular crops?

A. No.

Q. And is poultry litter or poultry waste used, to your knowledge, in feeding poultry?

A. To my knowledge, no.

Q. As a general rule, sir, in the Illinois River Watershed since the primary crops you've testified are fescue and Bermuda grass, is the feed that the poultry eats grown in that

soil test.
Q. So as a result of that rule, did people in Arkansas end up capturing more plots or more fields than they had been having tested before?
A. Yes, as a result of that rule, as you can see, there were a lot more fields that were sampled.
Q. All right, sir. What was the average STP value for the test results in Benton County in 2006?
A. The average in 2006 was 879 for Benton County and for Washington County, the average was 793.
Q. Would either one of those values be at least ten times the amount of phosphorus that's needed agronomically to grow crops?
A. Yes, they would.
Q. Let's look at exhibit -- excuse me -- 415, if we could. Before we talk about the numbers, Dr. Johnson, would you tell the Court basically what this shows, what this tabulation shows and what the source of the data was?
A. The source of the data was a set of soil test results representing George's and Tyson litter applications or litter applications associated with those or farmers associated with those integrators. And the data in the table is a summary of the results from those soil test reports.
Q. Okay. To your knowledge, were the original data things that have been produced in this case that you reviewed?
A. Yes, they were.

Q. All right, sir. We've talked, Dr. Johnson, about the nutrients, particularly the phosphorus that's in poultry litter, so that we know there are some nutrients there. But let me ask you this. As a general proposition, is poultry waste and poultry litter a good commercial type fertilizer?

A. No, it is not.

Q. Why do you say that, sir?

A. If it were a good fertilizer, it would be in demand by farmers who have identified nutrient deficiencies far away from where the poultry waste is generated and it would be sold by fertilizer retailers.

Q. How does the nutrient value per pound or per ton of poultry litter compare with the nutrient value of commercial fertilizer?

A. It's much, much less.

Q. As a result, does that mean you have to apply or move a larger weight of litter to get the same amount of fertilizer?

A. Yes.

Q. Or nutrient?

A. Yes, you would, yes.

Q. Okay. In your profession, sir, what do you mean when you talk about a soil conditioner or a soil amendment?

A. A soil conditioner or a soil amendment would be a material that could be applied to a soil to correct an existing chemical or physical property that was deficient in providing the

necessary support for crop production.
Q. Okay. Do you have experience prior to your retirement in reviewing for the Oklahoma Department of Agriculture, Food & Forestry proposed soil amendments that were coming on the market?
A. Yes.
Q. Do you feel like you understand what a soil amendment is and what ODAFF requires of a soil amendment?
A. Yes.
Q. Has anyone ever asked you to evaluate poultry litter as a soil amendment or a soil conditioner?
A. No.
Q. To your knowledge, Dr. Johnson, has anyone asked either you or anyone else at Oklahoma State University to evaluate poultry litter or poultry waste as a soil amendment?
A. No.
Q. Or soil conditioner?
A. No.
Q. Okay. Is, in your view, poultry litter a good soil conditioner or soil amendment?
A. No.
Q. Why not?
A. Well, because in order for it to be a good soil conditioner or amendment, it must have components that will correct a physical or chemical condition that's lacking in the

soil. And while organic matter can be added to soils to improve things like soil tilth and infiltration and moisture-holding capacity, in order for that to be effective, it needs to be incorporated into the soil, into the tillage depth.

Q. Is it your understanding that typically in the Illinois River Watershed poultry litter is incorporated into the soil or spread on top of the soil?

A. It's my understanding and it's my belief that it is seldom incorporated and most often the traditional application is simply a surface application.

Q. All right, sir. In your business and in your profession is unmanipulated animal manure considered a soil conditioner or a soil amendment?

A. No, it is not.

Q. And as we use these terms, are a soil conditioner and a soil amendment the same thing?

A. I believe so, yes.

Q. Okay. In the testimony that you've given, Dr. Johnson, have you taken any account of the bacterial content of poultry waste as opposed to the nutrients that we've discussed?

A. No.

MR. NANCE: Nothing further, Your Honor, oh, other than to move admission of the exhibits.

THE COURT: Very well. Those exhibits, do they have

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, ex rel, W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA, and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA,	§	
Plaintiff,	§	CASE NO. 05-CV-329-GKF-SAJ
V.	§	
TYSON FOODS, TYSON POULTRY, INC., TYSON CHICKEN, INC., COBB-VANTRESS, INC., AVIAGEN, INC., CAL-MAINE FOODS, INC., CAL-MAINE FARMS, INC., CARGILL, INC., CARGILL TURKEY PRODUCTS, LLC, GEORGE'S, INC., GEORGE'S FARMS, INC., PETERSON FARMS, INC., SIMMONS FOODS, INC. AND WILLOWBROOK FOODS, INC.	§	
Defendants.		

EXPERT REPORT OF GORDON V. JOHNSON, Ph.D

1. Introduction

I, Gordon V. Johnson, grew up and lived on a small diversified farm in North Dakota until attending North Dakota State University, where I received a B.S. in agriculture majoring in Soil Science in 1963. I received a M.S. in Soil Science from the University of Nevada (Reno) in 1966 and a Ph. D in Soil Science from the University of Nebraska in 1969. From 1969 to 1977 I taught undergraduate

EXHIBIT 40

and graduate classes, and conducted laboratory and field research in nutrient management at The University of Arizona. From 1977 to my retirement in 2004 I served as State Specialist in nutrient management for the Cooperative Extension Service at Oklahoma State University. In this capacity I provided educational programs in nutrient management to OSU County Extension Agents and Area Specialized Agents in Agronomy, and to State, District and Field technical staff of the Natural Resource Conservation Service (NRCS). I also developed, taught, and provided the exams for the statewide Nutrient Management Certification program for NRCS and for the Certified Crop Advisory program for Oklahoma. I have served in many regional and national professional organizations, received numerous achievement awards and published over 100 journal articles and fact sheets on nutrient management. From 1977 to 1990 I served as Director of the Soil, Water, and Forage Analytical Laboratories at OSU. I retired from OSU as Regents Professor of Soil Science and retain Emeriti status. Professional activities, including publications are identified in my attached curriculum vita.

2. Professional Service

a. I have been retained by the State of Oklahoma to evaluate:
   i. The agronomic reasonableness of poultry litter application to land in the Illinois River Watershed (IRW);
   ii. Behavior of phosphorus in soils and the environment.
   iii. Phosphorus (P) as an essential macronutrient for plants.
   iv. Nutrient Management.
   v. Litter as a P nutrient source.
   vi. STP and P management in the IRW.
   vii. Soil amendments.
   viii. NRCS 590 and P index use.
   ix. STP and soluble P in field runoff.
   x. Litter land application practices.

Agricultural practices are considered "agronomic" if the practices are essential to effective and economic soil management and crop production. As a result of my study, research, and teaching of nutrient management for agronomic crops, I am familiar with the soils and crops in the Illinois River Watershed. I have presented educational programs on nutrient management to land owners and operators of farms in the Illinois River Watershed and I am familiar with their practice of application of poultry litter to pasture and hay (forage) fields. My rate of compensation is $110 per hour and I have billed a total of $81,573.07 to date. In rendering my opinions I am relying on my career professional experiences and scientific literature that I have reviewed and considered. I have testified in no other cases, either by trial or deposition, within the past four years.

3. Behavior of Phosphorus in Soils and the Environment.

a. Elemental P does not exist in nature, and is only a phenomenon of the laboratory and industry. White elemental P is a very reactive solid at room temperature and must be stored under water to prevent its reaction with oxygen (O_2). When exposed to the atmosphere it reacts violently with O_2. In nature P exists in combination with oxygen as the oxy-anion, orthophosphate (PO_4^{3-}), which is relatively stable, but bound with cations to form a variety of compounds. When hydrogen (H^+) is the only cation (laboratory situations), phosphate is present in the moderately strong phosphoric acid, H_3PO_4.

b. In soil solutions, PO_4^{3-} will react with whatever cations have the highest charge and are present in highest concentration. A deciding factor in what compound will eventually be formed by reacting with PO_4^{3-}, is the stability of the final compound formed. Thus, because aluminum phosphate ($AlPO_4$) and iron phosphate ($FePO_4$) are extremely stable, they are formed in soils acidic enough to cause aluminum (Al^{3+}) and iron (Fe^{3+}) to dissolve and be present to react with PO_4^{3-}. In soils where the pH is above 5.5 there is enough calcium (Ca^{2+}) present to form calcium phosphates, the least soluble (most stable) being rock phosphate or the mineral apatite ($Ca_5(PO_4)_3OH$). Rock phosphate is mined commercially from geologic marine deposits and is the primary raw material from which commercial fertilizer is manufactured.

c. Whenever fertilizer is added to soils the soluble phosphate will begin to react with calcium present in the soil to form various calcium phosphates of low solubility (plant availability) the final product (after about two years) being rock phosphate. In soils of pH suitable for plant growth (pH 5 to 8), the hydrogen (H^+) concentration in the soil solution is very low (1×10^{-5} to 1×10^{-8} mole/liter). These concentrations allow small amounts of PO_4^{3-} to be present in combination with H^+ in the form of $H_2PO_4^-$ and HPO_4^{2-}, the ionic forms of P taken up by plants.

d. Soils typically contain forms of organic and inorganic P in total amounts ranging from about 200 to 6,000 lb/acre. As plants grow they absorb inorganic water soluble P from the soil. Water soluble P removed by plants is repeatedly replenished by chemical transformation of less soluble forms of P in the soil to water soluble forms as a result of mass-balance, chemical equilibrium reactions.

4. Phosphorus (P) as an essential macronutrient for plants.

a. Phosphorus is one of 16 chemical elements essential for plants to grow and complete their life-cycle. Three of the elements, carbon (C), hydrogen (H) and oxygen (O) are supplied through absorption from air and water. The remaining 13 are absorbed primarily from the soil and are categorically grouped according to their common deficiency in soils, which is also closely related to the amount used by plants. Nitrogen (N), P, and potassium (K) commonly become deficient in intensively cropped soils because plants contain large amounts of these nutrients compared to available soil levels. They are classified as "primary nutrients" or "macronutrients". Less commonly deficient are the "secondary" nutrients calcium (Ca), magnesium (Mg) and sulfur (S). The "micronutrients" iron (Fe), manganese (Mn), copper (Cu) zinc (Zn), boron (B), chlorine (Cl) and molybdenum (Mo) are found in the lowest concentration in plants and are seldom deficient in soils.

b. Plants use much larger amounts of N (1 to 3 %) and K (about 1 %) than P (about 0. 2 to 0.4 %). Phosphorus is absorbed by plants in the form of orthophosphate, an inorganic anion of single ($H_2PO_4^-$) or double charge ($H_2PO_4^{2-}$). A primary function of P within the plant is in energy transfer, as a component of ADP (adenosine di-phosphate) and ATP (adenosine tri-phosphate), and it is easily transferred from old tissue to new tissue when soil supplies are deficient. Deficient leaves become discolored, and appear chlorotic (yellow) and often purple.

5. Nutrient Management.

a. The management of nutrients for agronomic production developed as farmers and soil scientists observed that crop yield could be maintained in intensively cropped fields with the addition of fertilizer. Early in American agriculture fertilizer materials included animal manure, rock phosphate, wood ashes, and various forms of mined nitrates. The amounts of these materials applied to a given field depended upon the cost and availability of the materials. Use of these fertilizers was also influenced by the anticipated increase in crop yields. Early research led to the common understanding that crops most often responded to soil inputs of nitrogen (N) phosphorus (P) and potassium (K), although other "secondary" (Ca, Mg, and S) and "micronutrients" (Fe, Zn, Mn, Cu, B, Cl, and Mo) were also essential for plant growth and development. Therefore, interest grew in developing technology that could identify how much N, P, or K should be applied to a field to gain the maximum crop yield at the least cost. The development of soil test procedures for N, P, and K followed.

b. Although most soil P exists in solid form and plants absorb water soluble P, neither soil analysis evaluating water soluble P nor total soil P accurately predicted the soils capacity to provide a crop's P need for

maximum crop yield. Instead, chemical extractants were developed that successfully mimicked plant use of P. Using these extractants a relationship was developed between P extraction amounts (soil test P, or "STP") and crop yield. This relationship is called soil test correlation. Finally, the STP results were related to crop yield response from fertilizer P addition through field experiments performed on farmer's fields and at OSU Agricultural Experiment Stations. The result of this work is that the tests are calibrated, and we know that an STP of 65 lb P/acre (ppm times a factor of 2.0 is equivalent to lb/acre) provides a maximum benefit of 100% P sufficiency for efficient forage crop production of bermudagrass and fescue and an STP of 40 provides 95% yield sufficiency for these crops. Because there is no P benefit to crops once the STP is 65 lb/acre or higher, this STP becomes the agronomic critical level (ACL). Bermudagrass and fescue are the predominate forages grown in the IRW.

c. These correlation-calibration P relationships that establish good agronomic use of P as a fertilizer have been published by the Oklahoma State University in OSU Bulletins and "Fact Sheets" that include tables showing the relationship and the need, if any, for additional P as a fertilizer to accomplish maximum crop yield. These publications include a table showing the categorization of soil test results and identify a STP value of 65 as being adequate , i.e., any additional input of P fertilizer would have no agronomic benefit. This calibration was originally published in 1965 and has been verified by field research through time (Baumann, 1965.) The following tables are reproductions of the tables that were first published in the OSU Fact Sheet 2225 (Baker and Tucker, 1973) and are in the current OSU fact sheet widely used for nutrient management and soil test interpretation (Zhang, H., et al., 2006).

Table 1. Soil test P calibrations for fescue and bermudagrass.

Calibration for fescue:

PHOSPHORUS REQUIREMENT		
Soil Test P (STP)	COOL SEASON GRASSES BROME, ORCHARD, FESCUE	Fertilizer P_2O_5
Lbs/A	Percent Sufficiency	Lbs/A
0	30	80
10	50	60
20	70	40
40	**95**	**30**
65+	**100**	**none**

Calibration for bermudagrass:

PHOSPHORUS REQUIREMENT		
Soil Test P (STP)	BERMUDA	Fertilizer P_2O_5
Lbs/A	Percent Sufficiency	Lbs/A
0	50	75
10	65	60
20	80	40
40	**95**	**20**
65+	**100**	**none**

These tables show the relationship between soil test P (STP) values (in the range of 0-65 lb P/acre), the percent sufficiency of maximum crop yield associated with an STP value, and the amount of P fertilizer to correct the identified deficiency and improve crop yield to 100 percent of maximum. These long standing evaluations, illustrated in the graph below from a recent fact sheet, show that additional P fertilizer is not needed when the STP is greater than 65 (Zhang, et al., 2002).

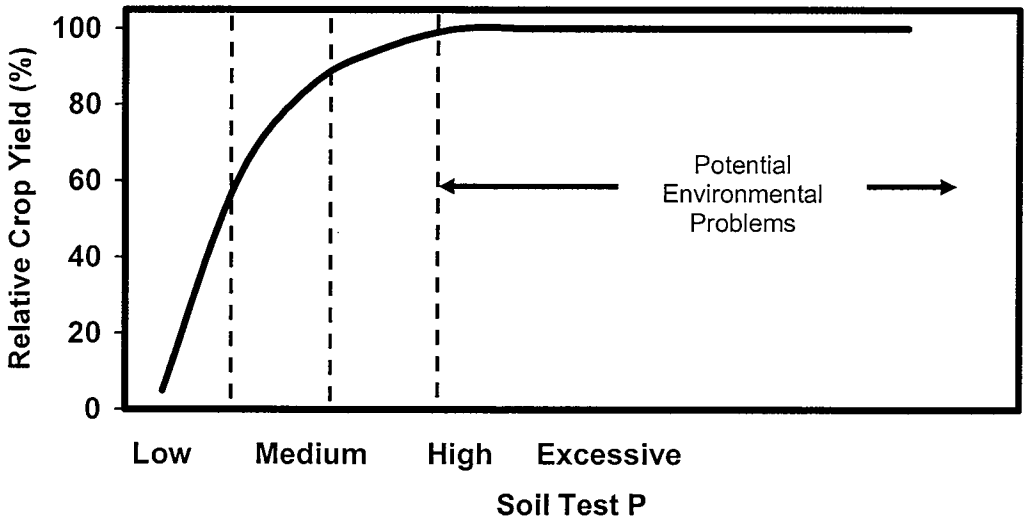

Figure 1. Relationship between soil test P and relative crop yield.

The first OSU fact sheet, published to help farmers understand the use of soil test results (Baker, 1974) recognized the value of prudent use of P fertilization and stated:

> "Ideally all soils of Oklahoma would be liberally fertilized with phosphorus until the soil test value reached 40 pounds per acre. Once this value is reached only maintenance applications would be needed. Occasionally, a soil will have been fertilized or will contain enough native phosphorus that it will test above 65 pounds per acre. In these cases, no phosphorus should be applied. Applying phosphorus to soils that test above 65 pounds per acre is not only costly but could eventually be detrimental."

The fact sheet tables also show that when the STP is moderately deficient (STP of 40) there is only a 5% loss in crop yield and that an input of only 20 to 30 lb/acre of P_2O_5 would correct the 5% deficiency.

d. I have reviewed STP calibrations of other Land Grant universities in the Southern Region of the US and found that these states use a similar calibration and agronomic critical level (ACL). The table below was published by the Southern Region SERA-6 work group on soil testing and plant analysis (Savoy, 2007).

Table 2. 2007 critical STP levels in the Southern Region of the US.[1]

States using Mehlich-1			VL	L	**M**	H	VH
State	Soil	Crop			**Phosphorus, lb/acre**		
AL	CEC<9[3]	All except peanuts	0-12	13-25	**26-50**	51-100	101-200
FL	All	All	0-20	21-30	**31-60**	61-100	120+
GA	Coastal Plains	Forage grasses		0-30	**31-60**	61-100	101+
	Piedmont	Forage grasses		0-20	**21-40**	41-75	75+
SC	Coastal Plains	All except peanuts	0-10	11-30	**31-60**	61-120	121-240
	Piedmont	All except peanuts	0-6	7-20	**21-40**	41-80	81-240
TN	All	All except Cotton		0-18	**19-30**	31-120	121+
VA	All	All	0-3	4-11	**12-35**	36-110	111+
States using Mehlich-3							
AR	All	Forage grasses		0-59	**60-100**	>100	
KY	All	Corn, soybean	0-5	6-27	**28-60**	61+	
LA	Costal Plains	All	0-10	11-40	**41-80**	81+	
NC	All	All	0-21	22-54	**55-107**	108-214	215+
OK	All	All	0-20	21-40	**41-65**	65+	
TX[2]	All	Forages			**100**		

[1] Savoy, H.J. 2007.
[2] Texas Cooperative Extension Service.
[3] CEC is an abbreviation for cation exchange capacity, the ability of the soil to adsorb cations (positive charged ions), and is also an indicator of the soil's surface area and likelihood of surface P adsorption.

For the five states using the Mehlich-3 procedure, the ACL is in the range from 60 to 107 lb P/acre. States using the Mehlich-1 typically have smaller ACL values because the extractant is less acidic. A general conversion for Mehlich-1 to Mehlich-3 is provided by the regression equation below (Southern Regional Fact Sheet. 2005).

$$M\ 3 = 1.43 \times M\ 1 + 18.6$$

The specific STP value identified with the ACL would be the largest STP value in the medium (**M**) category, since larger values would move the STP into the H category which is identified with the definition, "Yield increase to the added nutrient is not expected. The soil can supply the entire crop nutrient requirement. No additional fertilizer is needed."

6. Litter as a P nutrient source.

a. All plant materials contain each of the 16 essential plant nutrients, listed in paragraph 4, in various forms and concentrations depending upon the condition or state of the material. Similarly, animal manure, having originated primarily from plant material will also contain these elements. Historically, animal manure was a good source of nutrients for plants because it was deposited on the soil over an area from which the animals harvested plants. In the natural animal-plant setting, animal manure deposition would not be expected to occur repeatedly on the exact same area, and it may have been several years before the same area received a second "application" of animal manure. Small amounts of P and large amounts of K required by plants could be supplied by native soil sources to support vigorous growth in native grass ecosystems. Large amounts of N required by plants could be supplied from native soil organic matter sources and decay of legume (plants that fix N from the atmosphere by symbiotic association with bacteria in the soil) residue.

b. The N content of grass forages high in protein (19 % Crude protein) may be as great as 3 %, more than 10 times the content of P and 3 times the content of K. Expressed in the form common for fertilizers, (N, P_2O_5, and K_2O) this is about a 6:1:2 ratio. By comparison, poultry litter generally has about a 1:1:1 ratio. Nitrogen can be lost from animal waste by leaching (as nitrate) and volatilization (as ammonia and nitrous oxides) depending on the pH and moisture conditions under which the waste accumulates and is transported. Phosphate is not subject to loss by volatilization, thus the P_2O_5 content of litter may often be higher than that for N or K_2O.

c. Poultry litter is a good source of P for soils that have low STP. However, it is not a good fertilizer as a whole, because it does not provide the nutrients in the ratios and amounts required to maintain grass forage production as exists in the IRW. Unlike commercial, inorganic fertilizers like urea, ammonium nitrate, and diammonium phosphate, the N and P_2O_5 in litter is not all readily available to plants because much of it is bound in the organic portion of the litter. These nutrients become plant available during the growing season of the crop as a result of microbial decomposition of the litter. Most of the P_2O_5 and over one-half of the N will become available the first year after application. The remaining N will become available in the second and third years after litter application. When litter is applied to meet the N requirement of high protein forage there will be about 6 times more P_2O_5 applied than required by the crops. While this may be beneficial when the STP is below the ACL, it is inconsistent with good agricultural practice and especially undesirable when the STP is above the ACL and the field is in a P-limited watershed, such as the IRW. Applied P that is in excess of crop uptake will accumulate in the soil and raise the STP about 1 lb P/acre for every 10 to 15 lb excess P_2O_5/acre.

Similarly, when no P is added the STP will decrease by about the same factor. Consequently, when STP is excessively high it may take decades of forage removal by haying to reduce it to 65 lb P/acre. For example, when the STP is 300 lb P/acre it would require the removal of 3 ton of forage as hay for 85 years to lower the STP to 65 lb P/acre, with no P inputs. It would take centuries to cause the same reduction in a pasture situation because 90 %, or more, of the P in forage consumed by the animals passes through them and is returned to the soil. When all the Arkansas soil samples tested in 2003, identified for forage production are considered for agronomic input (STP <65 lb P/acre) and crop removal the average STP for all the samples, even those exclusively for hay production, require a few hundred years to reach near 65 lb P/acre. Figure 2 illustrates the extreme time period required for average STP values to approach ACLs, especially when the land is used for pasture. Since 2003 STP values were used instead of the 2006 – 2007 values that are more representative of poultry waste disposal and about 2 times higher, this estimate is very conservative.

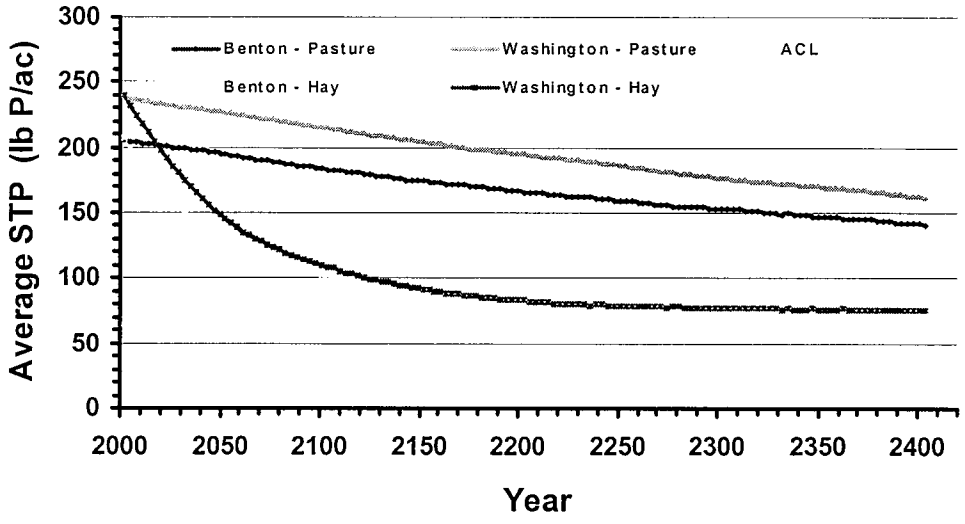

Figure 2. Projected decline in average STP values for Washington and Benton counties when P depletion is by haying, pasture use, and runoff using 2003 STP values as a basis. P input is projected when STP is <65 and results for 3 years from an input of 3 ton of poultry litter per year.

Concern for P management from animal manure and poultry litter is common among land-grant university faculty and has been expressed in their publications (Zhang, et al., 2002; Daniels et al., 2004)

7. STP and P management in the IRW.

a. I have evaluated available information to determine if I can form an opinion on the agronomic P needs in the Illinois River Watershed using the STP correlations and calibrations discussed above. Based on the 2002 Census of Agriculture, 92.3 % of the total cropland is forage production (pasture or hay) for the counties within which the IRW resides in Oklahoma and Arkansas (2002 Census of Agriculture). Fescue and bermudagrass are the primary forages used for pasture and hay production. For these crops an STP value of 65 produces the maximum crop yield. Therefore, application of P to fields where soils are at or above an STP of 65 is not an agronomically reasonable practice. If the STP levels in IRW soils reach this maximum agronomic level, then those soils would not reasonably require additional P inputs from poultry litter.

b. I have reviewed the STP results from a Court supervised, land application of litter project in the Eucha-Spavinaw watershed in Eastern Oklahoma and Western Arkansas for 2006 and 2007. These soil tests were performed as a prerequisite to land application of poultry litter on managed for pasture and hay production. Integrators, identified in the database provided by the manager are Peterson Farms, Simmons, Tyson, Cobb-Vantress, Georges, Cargill, and Moark (see Excel data files). The test results would be typical for fields where poultry litter application occurs in Oklahoma and Arkansas. As such, they reflect STP for pasture soils in the IRW because of the similarity of land use, poultry operation and soil types in these contiguous watersheds. Of 617 observations in Arkansas, 601 (97%) had STP values in excess of 65 lb/acre and only 5 (< 1%) had values less than 40. The average STP (290 lb P/acre)for Arkansas samples was more than four times the agronomically reasonable STP of 65. For the 678 samples from Oklahoma the average STP was 165, 81 % had STP values greater than 65 and 91 % of the samples were greater than 40. The average STP was 2.5 times the agronomically reasonable STP of 65 (Figure 3). The sampling depth was set at 4 inches by the court and thus the calculated lb/acre STP is likely less than it would be for a 6-inch depth.

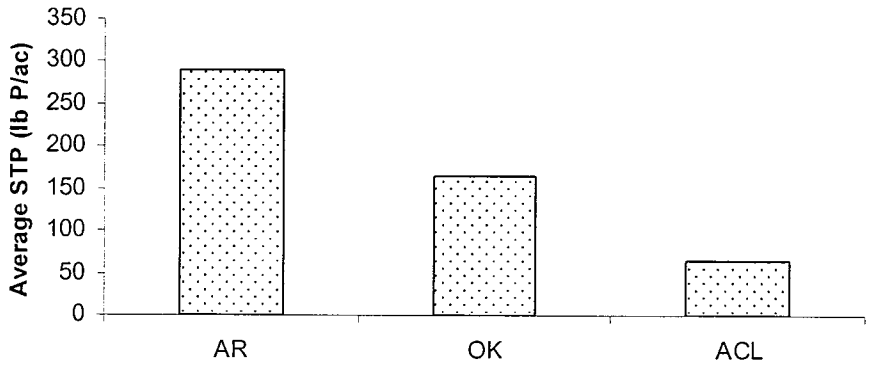

Figure 3. Average STP of samples from fields where poultry litter was applied in the Eucha – Spavinaw Watershed in 2006 and 2007 relative to the agronomic critical level of 65 (ACL).

c. A second data set of STP values for IRW soils from growers for defendants Georges and Tyson is shown in Table 2.

Table 2. Soil test N and P values for samples from Georges and Tyson growers.

	Georges			Tyson		
	Average N and P soil test values (lb/ac)					
Year	number	N	P	number	N	P
2000				35	13	66
2001	147	97	141	23	13	135
2002	63	74	354	47	13	268
2003	8	94	507	52	17	495
2004	34	63	763	12	35	752
2005	19	71	1166	4	14	1211
ALL	274	88	345	173	16	333
Range			19-1746			27-1529
Average STP of highest 1/4			792			667
Average STP of samples >65			395			364
% of samples with STP>65			85			90
% of samples with STP<40			6			3

For the period 2000 – 2005, the 173 values identified with Georges averaged 345 lb P/acre, over 5 times the ACL. Eighty five percent were greater than 65 and only 6 % of the samples had an STP less than 40. The upper 25% of these samples had an average STP of 792 (more than 10 times the ACL). The samples identified for Tyson growers averaged

333 (also 5 times the ACL), with 90 % above 65 and only 3 % less than 40. Additionally, the average available N was 16 for the samples associated with Tyson and 88 lb N/acre with samples associated with Georges, indicating a long practice of excess N and P input to these soils. Application of poultry litter sufficient to raise STP and available N to these levels is not a reasonable agronomic practice. Rather it indicates that such poultry litter application was disposal of waste. As a comparison, where land application of poultry waste is not common, as in 18 eastern Oklahoma counties where litter production is less than 1,000 tons per year, the average STP is 38 lb P/acre for the 2004-2006 period (OSU soil testing lab STP data and 2002 Census of Agriculture poultry production data, see Excel data files).

d. I have also examined results of soil tests from the public soil testing labs at the University of Arkansas and Oklahoma State University for the last three years data from counties within which the IRW resides (Benton and Washington counties in Arkansas and Adair, Cherokee, Delaware and Sequoyah counties in Oklahoma). These samples represent all samples collected within each county from fields identified for forage production. Therefore this collection of samples would be expected to include fields that have historically had P input from poultry litter, those with historic input of P from commercial fertilizer, and those that may be sampled for the first time to diagnose production problems. Commercial fertilizer is likely used when fields are not close to a source of poultry litter. Because commercial fertilizer-P is more costly than litter-P, farmers generally do not apply more than will be beneficial for the crop and STP values are generally maintained near 65 (as indicated in (6d) above, by the average STP of 38 for 18 eastern Oklahoma counties where annual litter production is less than 1,000 tons.) To the extent commercial fertilizer is used instead of poultry litter-P in these counties, the county average STP will be less than what is reported for fields receiving poultry litter-P (paragraphs (6b) and (6c) above). Nevertheless, even for these county-wide results, the average STP was 402 lb P/acre and 90 % of the 6558 samples from Arkansas counties from 2005 to 2007 had STP values in excess of 65 lb/acre, and 96 % had values greater than 40 lb/acre, the 95% crop yield sufficiency level (Arkansas soil testing lab). Results from the Oklahoma counties for 2005 to 2007 had an average STP of 102 lb P/acre and showed that of 4,216 samples, 78 % had values greater than 65 and 83 % had values greater than 40 lb/acre (OSU Soil, Water and Forage Analytical Laboratory, annual summaries).

e. The Arkansas legislature recently passed new laws that went into effect on January 1, 2006. These laws require STP analysis before poultry litter can be land applied. The effect of this legislation became evident in review of

soil test results for Benton and Washington counties. From 2000 to 2005, the average number of soil samples tested each year associated with forage production, was 299 and 223 for Benton and Washington counties, and the average STP values, although more than double the ACL of 65, were 174 and 140, respectively. The total number of samples increased dramatically in 2006 and 2007, to an annual average of 1088 for Benton County and 1803 for Washington County. The respective STP values also greatly increased and averaged 453 and 426 respectively. The upper 25 % of samples averaged over 900 lb P/acre, with the highest 17 samples exceeding 3,000 lb P/acre. Phosphorus deficiency (i.e., less than 65 STP) was indicated for only 5.0 % of the samples for Benton County and 8.3 % of the samples for Washington County. Although the results for these two years still include samples outside of the IRW and samples where commercial fertilizer is the source of nutrients, the dramatic change in number of samples is a result of newly required tests where poultry litter has been, and was intended to be, applied. The dramatic increase in average STP values, which are more than six times the adequate level for crops, and the presence of such astronomically high soil test results, is a clear indication excessive poultry litter P has been applied in the past and fertilizer P is no longer needed for the vast majority (93 %) of these fields.

f. I have reviewed the Arkansas Natural Resources Commission annual reports that record STP values associated with comprehensive nutrient management plans developed for land application of litter.

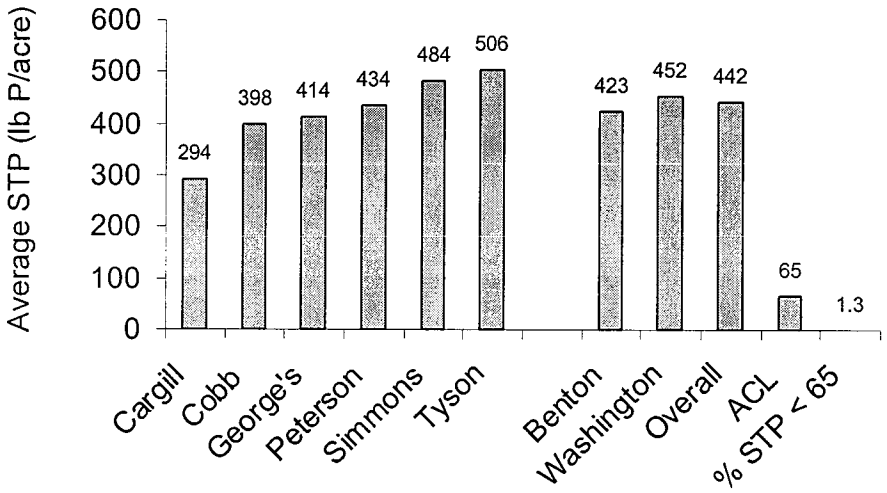

Figure 4. Soil test P values from Arkansas Natural Resources Commission registry for litter management, 2007. Integrators were identified only for Benton County.

This data represents STP values for fields where poultry litter waste was being land applied in the IRW in 2007 by growers associated with the indicated integrators. Overall there were 224 STP values expressed as "Avg. P Level". Each "Avg. P Level" often representing several hundred acres. For example, an "Avg. P Level" of 539 lb P/acre was identified with 886 acres associated with the integrator Cargill. Similarly, an "Avg. P Level" of 761 lb P/acre was associated with 500 acres for a Tyson grower(s).

g. I have also reviewed recent studies by the USDA that have examined the capacity of counties to assimilate nutrients from animal manure. Using animal census data from 1982 and 1997 these USDA studies have shown that nationally over 50 % of the on-farm excess N and P is from poultry production (Gollehon, et al., 2001) An estimated 97 % of the animal manure produced and land applied in the IRW is poultry litter (from 2002 Census of Agriculture livestock data). Using 1997 data, the USDA concluded categorically that between 75 -100 % of the on-farm N and P from animal manure generated in Washington and Benton Counties in Arkansas and Delaware County in Oklahoma was in excess of the farms' ability to reasonably assimilate the nutrients as fertilizer. Adair, Cherokee and Sequoyah counties in Oklahoma were categorized as 50 – 75 % in excess of the farms' ability to agronomically assimilate the nutrients (Confined Animal Production and Manure Nutrients. USDA 2001. pg 25-26; Fig 25-26.). This 1997 "excess" of these nutrients is now likely to have become even greater because poultry production has increased since 1997 and IRW soils have become more nutrient saturated. The government studies did not consider available soil nutrients identified by current soil tests, and thus are conservative estimates of the P excesses.

h. A recent study relating N and P inputs from fertilizer and manure, removal by harvested crops, and the balance of deficiency or excess was conducted in Arkansas (Slaton, et al., 2004). Separating the state into nine districts, the five-year study concluded that poultry litter accounted for 96 % of the total manure-derived N, P, and K in the state. They also concluded that although forage uptake of P is high for areas of western Arkansas where poultry litter production is greatest, "nutrients removed by forage crops are usually fed or recycled on-farm rather than exported outside the district boundaries". They further stated that "...most soils used for warm-and cool-season grass production in Arkansas already have adequate Mehlich 3-extractable P levels that do not require additional P fertilization for forage production..." With regard to the balance of inputs

and removal of P they concluded "The greatest excess of N and P exists in District 1 ..." within which Benton and Washington counties are included. They also concluded that "The results from this assessment may help reinforce the thought that current nutrient application strategies in western Arkansas are not sustainable without the danger of creating and/or exacerbating water quality issues from excessive nutrients. Transport of excessive N and P contained in poultry litter outside of the central and western Arkansas districts that have restricted land area available for nutrient application is needed if the current poultry production levels are to be maintained." Similar to the USDA study in (g.) above, they did not consider soil contributions to provide crop P when they calculated the balance between manure inputs and crop removal and, consequently, the statements of excess P are greatly underestimated.

i. Based upon my review of the above STP values and reports of nutrient excesses, it is clear that land application of poultry litter has led to excessive P build-up in land within the IRW. The need for additional widespread land application of poultry litter as a P fertilizer does not exist. Almost all continued land application of poultry litter within the IRW should be judged as a waste disposal practice rather than fertilization. Given the low percentage of fields with STP values less than 65 and the large amount of litter produced in the IRW, most of the litter should not be applied within the IRW. Very few forage fields in the IRW would reasonably require additional application of poultry litter under good agronomic practices.

8. Soil amendments.
   a. Amending soils is a practice where materials are added to soils to correct conditions that have been identified as limiting normal soil productivity. Under State law, only materials that are proven to correct these limiting conditions may be licensed as soil amendments (Oklahoma Soil Amendment Act). Unmanipulated animal manures are specifically excluded from the definition of soil amendments . Additionally, to be effective, soil amendments must typically be incorporated into the soil by tilling and used to correct an identified production-limiting, soil property. Land application of poultry litter to pasture and hay land in the IRW usually involves only surface spreading without tilling. Consequently, land application of litter in the watershed does not qualify as a soil amending practice and it is unlikely that significant non-fertilizer benefits could be obtained.

9. NRCS 590 and P index use.
   a. I have examined the NRCS Code 590 guidelines and the use of phosphorus indexes (PI) in the Southern Region of the US. Most of the

states have 590 tables identifying applicable animal waste application rates based upon "environmental threshold" STP levels. States that do not have such tables suggest use of a PI instead.

b. The widespread use of these guidelines, in the US as well as the Southern Region, should not be interpreted as a sign of widespread scientific support, as is sometimes suggested, but rather as a result of a large NRCS presence in every state.

c. The 590 documents typically identify limits for commercial fertilizer inputs on the basis of agronomic critical levels (ACL) from long-standing, scientifically based STP calibrations. These ACL tables are used by NRCS to identify the limits for subsidizing (cost-share) fertilizer inputs for conservation practices by farmers receiving government assistance. NRCS has no enforcement authority except to deny assistance when guidelines are not followed.

d. The 590 documents typically include separate tables to identify animal waste application rates for "Non-Nutrient Limited watersheds" and "Nutrient Limited Watersheds". Application rates in these tables are not science-based, but rather the result of opinions on what may or may not cause environmental impact. These opinions have produced tables identifying animal waste land application rates related to N crop requirement and STP environmental threshold levels. Nitrogen crop requirements are scientifically based, incorporating crop N content and projected yield levels. Table STP values are not scientifically based and the levels used have not been related (calibrated) to actual soluble P in runoff or reaching surface water bodies. The Oklahoma NRCS 590 table for Non-Nutrient Limited Watersheds, for example, uses five categories of STP from "Low" to "Severe". The low category applies to STP values from 0 – 65 and allows animal waste rates to meet crop N requirements. STP values for other categories have no rational basis and range from 66 to 400 lb P/acre. The table for Nutrient Limited Watersheds is similar, with the exception that the upper limit STP value is 300 lb P/acre.

e. Implementation of both the 590 guidelines and PIs is based on the premise that relative risk to the environment is evaluated by the tool, and animal waste application rates governed accordingly. While much scientific effort has gone into calculating relative risk values, the acceptable maximum risk has not been identified. Furthermore, these tools have failed to adequately recognize that for P Nutrient Limited Watersheds, such as the IRW, the minimum risk is achieved by not applying P after the STP reaches 65. Use of the Arkansas PI has been defended because "A significant positive relationship was found between the average SRP

(soluble reactive P) concentration in runoff … and the P index…" in a recent Arkansas study (DeLaune, et al., 2004). The same research stated that "In contrast, poor relationships were observed between soil test P and SRP concentrations in runoff on each farm (Table 5). This can be attributed to the overwhelming influence of soluble P applied to the plots." Thus, even though STP may be excessive and contribute harmful levels of soluble P to surface waters, it is not considered independent of soluble P in the litter. Instead, the contribution of STP as a P source component in the PI is minimal because the PI risk calculations always include a component for soluble P in the litter.
Use of these tools are only a short-term solution to disposal of excess waste, and in the long-term waste P input must match agronomic use, as expressed by scientists of the Southern Region of the US, (Maguire et al.).

f. The philosophy of litter applications after STP levels have exceeded the ACL is to provide crop N requirements. However, when litter applications are made according to the NRCS 590 Code guidelines in Oklahoma and the Arkansas PI, neither litter N content nor soil test N are measured and used as a part of the comprehensive nutrient plans.

10. <u>STP and soluble P in field runoff.</u>

a. I have evaluated scientific literature related to STP and soluble P in runoff to form an opinion on the impact to surface water quality as a result of continued litter application based on phosphorus indexes, or other rules or guidelines, which allow litter application in excess of agronomic P requirements. Surface water runoff is a commonly accepted mechanism for P transport over the landscape (Figure 4 from Zhang et al., 2002).

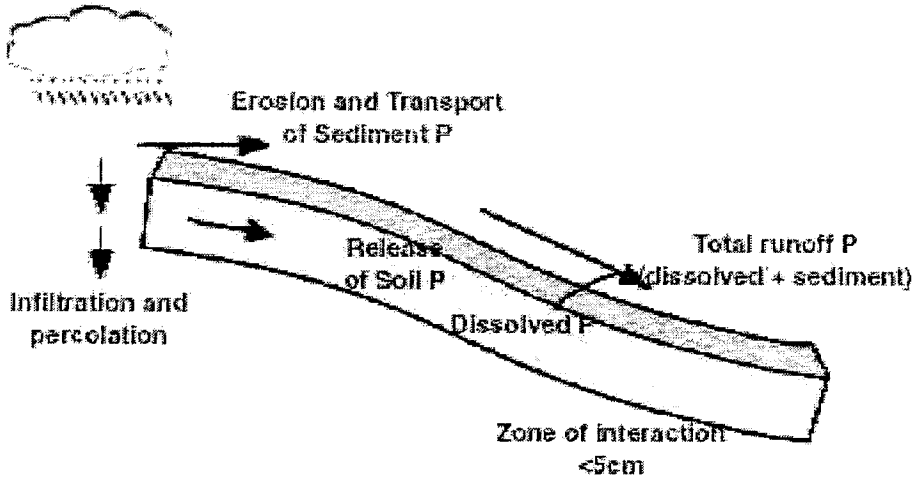

Figure 4. Mechanisms of phosphorus transport over landscape: erosion and runoff.

b. The average STP value was 38 lb P/acre (19 ppm) from forage land sampled during the period 2004 to 2006 for 19 Eastern Oklahoma counties for which poultry litter production was estimated to be less than 1,000 tons per year. For the same crops and period, the average STP was 80 lb/acre (40 ppm) for 10 counties for which poultry litter was greater than 1,000 tons per year. Within the IRW, 58 % of the land use is estimated to be pasture.

c. A recent review of published research on the relationship of STP to runoff P examined results from 17 studies representing 31 soils and a variety of management conditions (P.A. Vadas et al., 2005). They concluded "Overall, a single extraction coefficient (2.0 for Mehlich-3 P data,...) could be used in water quality models to approximate dissolved P release from soil to runoff for the majority of soil, hydrologic, or management conditions. " (Figure 5). Using the prediction equation from this publication (2 times ppm STP = ppb runoff P), the calculated concentrations of runoff P would be 0.038 ppm for the average STP values of counties with < 1,000 tons litter production per year. The estimated runoff concentration would be 0.80 ppm for counties with > 1,000 tons litter production per year.

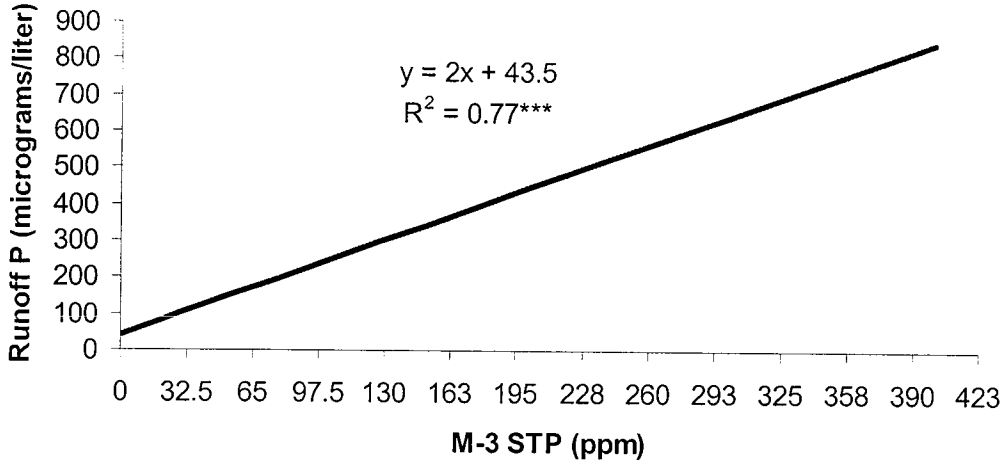

Figure 5. Relationship between Mehlich 3 soil test P and runoff P (P.A. Vadas et al., 2005).

d. The use of phosphorus indexes and/or NRCS 590 Code tables, as guides for animal waste management, promotes the land disposal of waste for its N value without adequate consideration of long-term impact of soil-P

buildup on surface water quality. Scientists of the SERA-17 work group (Organization to Minimize Phosphorus Losses from Agriculture), presented their "Position of SERA17 on Phosphorus-Indices" and concluded, "However, it should be understood that the implementation of P-Index based management only addresses short-term P loss issues. For long-term sustainability, applications of P must approach a balance with crop removal" (Maguire et al.). When these guides are used long-term most of the soils that can receive poultry litter will have attained the limiting STP value. In Oklahoma that value will be 300 lb P/acre, the NRCS highest value for nutrient limited watersheds. In Arkansas it will be 1100 lb P/acre, the maximum allowed by the Arkansas Phosphorus Index under Title XXII rules.

e. When the Vadas, et al. coefficient is used to calculate runoff concentration in the IRW, values of 300 ppb would result for Oklahoma and 1100 ppb for Arkansas. Adjusting these values for land use (only pastureland, 58 % of total area, would receive litter) in the IRW would result in concentrations of between 174 and 638 ppb P in runoff for the entire IRW. In contrast, when litter application is governed by agronomic benefit from P the concentration would be only 38 ppb even if all the pastureland soils tested 65 lb P/acre. In reality, a sufficient acreage of soils would not qualify for litter application because of slope, depth, and distance from streams, etc. so that less than 58 % of the land area would receive litter and the watershed concentration of P would be proportionately less.

f. Based upon the above considerations it is my opinion that continued use of NRCS Code 590 allowances for litter application rates in Oklahoma and rates allowed by the Arkansas Phosphorus Index-Title XXII rules in Arkansas, will lead to increasing concentration of soluble P in surface waters for many years in the future.

11. Evaluation of practices.

a. Given the forgoing evaluation, land application of poultry litter in the IRW has not been and would not be, for all but a few cases, an agronomically reasonable practice from a P nutrient or soil amendment perspective. Consequently, such practices have been and would continue to be poultry litter disposal rather than a soil fertilization or amendment.

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Gordon V. Johnson

Gordon V. Johnson

Subscribed and sworn to me by Gordon V. Johnson on the 13th day of May, 2008.

Signature

T J Payne

Printed Name

Notary Public, Payne County, Oklahoma

My Commission Expires: 04-18-2011

OFFICIAL SEAL
T J PAYNE
NOTARY PUBLIC OKLAHOMA
PAYNE COUNTY
COMM. EXP. 04-18-2011
COMM. NO. 07003848

IN THE UNITED STATES DISTRICT COURT FOR THE
NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA,

Plaintiff,

vs. 4:05-CV-00329-TCK-SAJ

TYSON FOODS, INC., et al,

Defendants.

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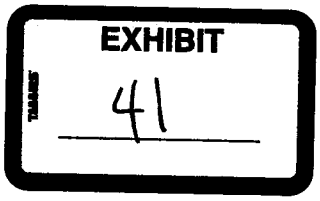
VOLUME I OF THE VIDEOTAPED DEPOSITION OF BERTON FISHER, PhD, produced as a witness on behalf of the Defendants in the above styled and numbered cause, taken on the 3rd day of September, 2008, in the City of Tulsa, County of Tulsa, State of Oklahoma, before me, Lisa A. Steinmeyer, a Certified Shorthand Reporter, duly certified under and by virtue of the laws of the State of Oklahoma.



to do that, I know you may have evening plans, but if you could find it this evening and then give me an opportunity to perhaps ask a question about it tomorrow, that would be helpful.

A Okay. 01:50PM

Q The other two instances where you observed poultry litter are apparently not as memorable to you; is that fair?

A They are not as memorable.

Q Okay. I assume there was no confrontation or 01:50PM fear on your part associated with those other two instances; is that correct?

A No. That's correct. They were incidental. I didn't photograph those. I was doing other things at the time. 01:51PM

Q On the bottom of Page 24 and then continuing on to Page 25, you make a point to say that poultry litter, excuse me, is broadcast spread on pastures and hayland within the watershed and is not incorporated into the soil surface by tilling; do 01:51PM you see that?

A Yes.

Q Okay. It seems to me you take issue with the fact that poultry litter is not incorporated into the soil surface by tilling. Am I reading that 01:51PM

correctly?

MR. GARREN: Object to form.

A No, you're not reading that correctly. I'm simply recording the fact that it is not.

Q Is it your opinion that poultry litter should be tilled into the soil in the Illinois River watershed? 01:51PM

A I don't have an opinion as to whether or not it should be tilled into the soil. I simply observed that by not tilling it into the soil puts it in a circumstance where it may be more readily transported. 01:51PM

Q You, in connection with your work in this case, Dr. Fisher, have had an opportunity to review nutrient management plans issued by the Oklahoma Department of Ag as well as the Arkansas Natural Resources Department; correct? 01:52PM

A Yes, I have.

Q Do these plans advise users of poultry litter about what they can and cannot do in terms of using poultry litter? 01:52PM

A In a general sense, yes.

Q Have you seen in any of those plans where the Arkansas Natural Resources Commission or ODAFF has instructed users of poultry litter to till it into 01:52PM

period?

MR. GARREN: Object as to form.

Q Is that fair?

A I think that's quite fair. We can see in these records that things don't add up, that there are too many chickens for the waste reported or that the waste reported in terms of stored, transferred off site or disposed is at dissidence with the total produced. They produce less than they dispose. 02:49PM

Q In the watershed? 02:49PM

A Yes.

Q All right. On Opinion No. 14, let's move on to it beginning at Page 34 of your report, I'll read your opinion. The mass of poultry waste generated within the Illinois River watershed but disposed outside the watershed is a minority of the waste generated within the watershed; correct? 02:50PM

A Yes. As contorted as that sentence might be, that is correct.

Q Okay, and your support for that statement, if I've read your report correctly, is the information supplied by George's regarding its own hauling, as well as information obtained from BMPs, Incorporated; correct? 02:50PM

A That's correct. 02:50PM

IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, ex rel, W.A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA, et al.	)	
Plaintiffs,	)	
V.	)	No. 05-CV-329-GKF-SAJ
TYSON FOODS, INC., et al.,	)	
Defendants.	)	

REPORTER'S TRANSCRIPT OF PROCEEDINGS

FEBRUARY 19, 2008

PRELIMINARY INJUNCTION HEARING

VOLUME I

BEFORE THE HONORABLE GREGORY K. FRIZZELL, Judge

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Glen R. Dorrough
UNITED STATES COURT REPORTER

EXHIBIT
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being overapplied and are needed for plant growth.

THE COURT: Well, but here they're focusing on E. coli and bacteria, not on phosphorus; correct?

MR. RYAN: I'm sorry, Your Honor?

THE COURT: In this proceeding are they not focusing on bacteria as opposed to phosphorus?

MR. RYAN: Yes, Your Honor. No, that's absolutely right, but we're talking about what the land needs and what's being overapplied.

THE COURT: Right, right.

MR. RYAN: I think their argument only goes to the phosphorus, to the one element of phosphorus. It does not address the other twelve elements which I say are needed for plant growth and are beneficial to the crops and plants and pastures and forage. And I don't think there's any question but that there has been an overapplication of litter on some or many farms. That's not an issue in our book. I'm certainly not arguing that in terms of phosphorus.

Your Honor, these are the defendants, there's 13 of them. They're in seven, if you will, if you disregard affiliated companies, there's seven companies. The plaintiffs want to treat us as if we were one homogenous group. And if they can show that the defendants, plural, apply bacteria somehow to the waterways and that makes all the defendants liable. These defendants are competitors of one another, Your

IN THE UNITED STATES DISTRICT COURT FOR THE
NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA,

Plaintiff,

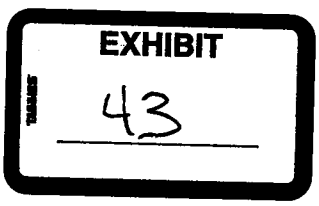
vs. 4:05-CV-00329-TCK-SAJ

TYSON FOODS, INC., et al,

Defendants.

- -

VOLUME II OF THE VIDEOTAPED DEPOSITION OF INDRAJEET CHAUBEY, PhD, produced as a witness on behalf of the Plaintiff in the above styled and numbered cause, taken on the 2nd day of March, 2009, in the City of Tulsa, County of Tulsa, State of Oklahoma, before me, Lisa A. Steinmeyer, a Certified Shorthand Reporter, duly certified under and by virtue of the laws of the State of Oklahoma.



cites Green and Haggard in 2001. Did you review that study?

A I have seen Green and Haggard 2001 study.

Q And is that one of the studies you talked about that had drawn similar conclusions as this study? 09:51AM

A Uh-huh.

Q Would that be a yes?

A Yes.

Q Thank you.

A I'm sorry.

Q In your opinion, Dr. Chaubey, is there a correlation between high STP levels and rates of poultry waste manure or poultry litter application?

MS. TUCKER: Object to form. 09:52AM

MR. BOND: Object to form.

Q Let me restate it. Based upon your knowledge, experience and expertise in this area, is high STP levels in soil an indicator of poultry waste application rates in excess of plant requirements? 09:52AM

MS. TUCKER: Same objection.

MR. BOND: Object to form.

MS. HILL: Object to the form.

MS. LONGWELL: Object to form. Calls for an undisclosed expert opinion. 09:52AM

A Yes.
Q What do you base your opinion on?
MS. LONGWELL: Same objection.
A There have been a number of published studies that indicate that if you apply animal manure, including poultry litter, in excess of what is needed by plants, then phosphorus would accumulate over time and that would be indicated as high STP. 09:53AM
Q Dr. Chaubey, can losses of nutrients occur from fields that are low in STP? 09:54AM
MS. TUCKER: Object to form.
MS. LONGWELL: Object to form.
A Yes.
Q And how is that; why does that occur?
MS. LONGWELL: Same objection. 09:55AM
A Runoff when it interacts with the soil, it will pick up nutrients, including phosphorus, from the soil column if any amount of phosphorus is present there. The level of magnitude may be different depending upon the STP. That's why you see some amount of phosphorus coming from entirely forested areas, which may have very, very low STP values. 09:55AM
Q Let's kind of change the subject a little bit. Are you familiar with what's referred to as the 09:56AM

MR. GARREN: Object to form.
A For a watershed assessment using GLEAMS or any other field scale model, you need to interface that or you need to have a routing model that goes with it, and that's one way you can do a watershed scale assessment, and it's done all the time. 11:29AM
Q Huh?
A It's done all the time by a number of modelers using GLEAMS and other field scale models.
Q Okay, but the routing model is very important? 11:30AM
MR. GARREN: Object to form.
A Yes.
Q Okay. I can't remember how this was stated in your first deposition, but do you hold the opinion that if you apply poultry litter over the agronomic rate, that it's waste disposal? 11:30AM
A I do.
Q You do?
A Yes.
Q Okay. What are you -- with respect to the agronomic rate, what nutrient are you looking at; are you looking at every nutrient in poultry litter or are you just looking at phosphorus? 11:30AM
A I am looking at both nitrogen and phosphorus because those are the two micronutrients of water 11:30AM

quality concern that I have been studying.
Q Okay, but whatever else is in there that's beneficial to the soil, you're not looking at that?
MR. GARREN: Object to form.
A It may be important, but in my studies I'm not concerned. 11:31AM
Q Okay. Okay. So if you use litter above the agronomic rate for phosphorus or nitrogen and -- hold on. Strike that. If you use -- if a farmer uses litter above the agronomic rate, are you talking about an instance where none of the nutrients in the litter are needed for the soil or all? 11:32AM
MR. GARREN: Object to form.
Q It's a bad question. I'm having a hard time formulating it but -- 11:32AM
A I'm not able to understand it either.
Q But if we're at -- if the soil test phosphorus is at, you know, let's say 160 and they apply poultry litter, are you saying in that instance that it's waste disposal? 11:32AM
A Yes.
Q Okay. Tell me why that's waste disposal.
A Because assuming you are growing fescue or Bermuda on that soil, which is the case here in the 11:32AM

Illinois River watershed, there is sufficient amount of phosphorus of a level already in the soil to support the plant growth. It does not need any more phosphorus. Therefore, applying any additional phosphorus is a disposal. 11:33AM

Q Okay. So is it a disposal of phosphorus because what if the grass needs nitrogen?

MR. GARREN: Object to form.

A It is true that grass needs nitrogen, and nitrogen may be supplied by other forms of 11:33AM fertilizer that does not have phosphorus into it.

Q Okay. What if the crop needs potassium?

A The same answer would hold true. Why -- why would you apply a nutrient that is not needed?

Q What if it needs two out of three nutrients 11:34AM that are found in poultry litter; is it waste disposal?

MR. GARREN: Object to form.

A It is -- it is a waste disposal given the environmental concerns and given the fact that 11:34AM phosphorus is a limiting nutrient in freshwater systems. So when present in excess, you get eutrophication, so it is a waste disposal.

Q It seems to me that under your theory, something can be waste disposal as well as 11:34AM

agronomically beneficial. Do you agree with that?

MR. GARREN: Object to form.

A I don't understand your logic here.

Q Okay. From an environmental perspective, you believe that applying phosphorus when it's not needed by the grass is waste disposal; correct? 11:35AM

A Yes.

Q Okay. Let's say that grass needs nitrogen and potassium but doesn't need phosphorus. The application of that poultry litter would be agronomically beneficial from a nitrogen and potassium standpoint; correct? 11:35AM

A Application of nitrogen and potassium will be beneficial to the grass. How you are meeting that need defines whether you are disposing of waste or not. If you are meeting that through inorganic fertilizers, which does not have phosphorus present, therefore, you are not putting any more phosphorus on the land than what is needed, is different from applying it through animal manure or triple 16, right, it's -- I believe that's one of the combinations of inorganic fertilizer, 16 percent nitrogen, 16 percent phosphorus, 16 percent potassium is present, but it also is fertilizer disposal at the best because are putting something 11:35AM 11:36AM

that is not needed for the plant growth.

Q Okay. In your work in the Eucha-Spavinaw watershed and your familiarity with the ESPI, does ESPI allow litter application on fields that are above the agronomic rate for any single nutrient, such as phosphorus? 11:36AM

A It looks at different risk alternatives, and it allows litter application under low or medium risk. It has been a while since I reviewed that table, but I believe it does allow litter application above strictly agronomic rates. 11:37AM

MR. BOND: Let's go off the Record.

VIDEOGRAPHER: We are off the Record at 11:37 a.m.

(Following a lunch recess at 11:37 a.m., proceedings continued on the Record at 12:52 p.m.) 11:37AM

VIDEOGRAPHER: We are now on the Record. The time is 12:52 p.m.

CROSS EXAMINATION

BY MS. TUCKER:

Q Dr. Chaubey, I'm K. C. Tucker and I represent the George's defendants in this matter. I apologize in advance. I'm going to jump around quite a bit. If at any point I'm unclear, let me know and I'll do 12:50PM

IN THE UNITED STATES DISTRICT COURT FOR THE
NORTHERN DISTRICT OF OKLAHOMA

W. A. DREW EDMONDSON, in his capacity as ATTORNEY GENERAL OF THE STATE OF OKLAHOMA and OKLAHOMA SECRETARY OF THE ENVIRONMENT C. MILES TOLBERT, in his capacity as the TRUSTEE FOR NATURAL RESOURCES FOR THE STATE OF OKLAHOMA,

Plaintiff,

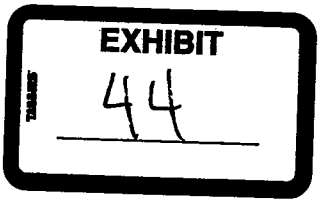
vs. 4:05-CV-00329-TCK-SAJ

TYSON FOODS, INC., et al,

Defendants.

- -

VOLUME I OF THE VIDEOTAPED 30(b)(6) DEPOSITION OF TEENA GUNTER, produced as a witness on behalf of the Defendants in the above styled and numbered cause, taken on the 27th day of August, 2008, in the City of Oklahoma City, County of Oklahoma, State of Oklahoma, before me, Lisa A. Steinmeyer, a Certified Shorthand Reporter, duly certified under and by virtue of the laws of the State of Oklahoma.



Q Okay, and a spring in the middle of my field, is that something that would be taken into consideration in my animal waste management plan?
A It would, but it's a matter of is it an annual stream, is it year round, does it always have flow or is it only certain times of the year, and is that all taken into account, and then are there certain times of the year after a big rainfall in another area of the state that infiltrates groundwater, does it come up through that field and create a runoff problem from that site. I mean, there's just so many different ways that it can occur. 04:03PM 04:03PM
Q Okay. We need to change tapes. We'll take a little break.
VIDEOGRAPHER: We're now off the Record. The time is 4:03 p.m. 04:03PM
(Following a short recess at 4:03 p.m., proceedings continued on the Record at 4:15 p.m.)
VIDEOGRAPHER: We are back on the Record. The time is 4:15 p.m. 04:15PM
Q Miss Gunter, before we went on break, we were talking about this Paragraph 7C in the regulations. You've given several examples. Would you agree with me that there has to be a violation of the animal waste management plan before there can be a runoff 04:16PM

in this as --

A No.

Q No. So your testimony is I can -- Farmer Jones, he can observe everything that's required of him in his animal waste management plan and he can still be in violation of this Paragraph C? 04:16PM

A The animal waste management plan is one piece of the statutory requirements, and there are many, many, many requirements in that animal waste requirement plan. However, throughout the statute there are also things regarding -- for example, look at the BMP section that we talked about a second ago in the statute on the 10-9.7, no discharge of poultry waters to waters of the state. No waters -- well, there's a given, but poultry waste handling, treatment, management and removal shall not create an environmental or a public health hazard, not result in the contamination of waters of the state and conform to such other handling, treatment, management and removal requirements deemed necessary by the department. Again, in the statute under C6C, poultry waste shall only be applied to suitable land at appropriate times and rates. Discharge or runoff of waste from the application site is prohibited. I mean, all of those things work together to create 04:16PM 04:16PM 04:17PM 04:17PM

the provisions that Farmer Jones has to comply with.
Q Okay. How does Farmer Jones comply with all of those if it's not the animal waste management plan?
A He's extra careful and he evaluates his field and he looks at them, and if he can -- the waste management plan is a ceiling in many cases. There's all kinds of level you can land apply at that don't have to be as much as the waste management plan says at every occasion. You can ratchet that down, and you can land apply a little whenever you think it's a time of year that may not be your best time of year that runoff can occur. You can take all kinds of steps in addition to your plan. I mean, your plan is let's do this, but it's you better not do beyond this as far as application and things like that go, but there's a million levels below that a responsible farmer, as the farmer you described, can look at, and if he wants to say, okay, well, my waste management plan says I can do this, but my soil test, for example, at the bottom, OSU says don't go above 65. Okay. I'll not go above 65 because that's the plant utilization, that the crops might not take up more than that. So if I'm going to be over the top careful and not create an

04:17PM 04:18PM 04:18PM 04:18PM 04:19PM

environmental or public health hazard, not create runoff, I'm more likely to be better off if I use that requirement or that suggestion from the soil result.

Q Okay. Does the OSU soil sample test, do those have the effect of law? 04:19PM

A You have to prepare your waste management plan taking into account the soil test results.

Q Okay, but the OSU soil sample tests results that I've seen have N, P and K and it has -- 04:19PM

A And results for that specific field.

Q -- a recommendation. Does that recommendation have the effect of law?

A The recommendation on it is one of the things that's taken into account in the plant, and it's 04:19PM information for the farmer to take into account to ensure compliance, but the -- where is it? Where am I looking? Let me look at my rules for a second. There's something that talks about it. It includes all nutrient analysis data, including soil and 04:20PM poultry waste testing, and I'm talking about 17-5-5A3. So that document is incorporated as a part of your animal waste management plan.

Q Okay. Does the recommendation that appears on that soil sample test, does that trump what it says 04:20PM

you can apply in your animal waste management plan?
A No. It's one of the many factors that you look at in the -- a plan is not rote, thou shalt do this, that shalt do this and you'll never have a problem. A plan is just exactly what it says. It's a plan. Here's guidelines. Here's things you need to take into consideration. Yes, you're required to take these things into consideration whenever you are doing your land application but, again, it's very similar. You don't want to exceed what they recommend in that plan, but all of that documentation should be taken into account by the individual producer when they're making sure they're in perfect compliance with the entire law. 04:20PM 04:21PM
Q Okay. My question still remains, how do they know if they're in compliance with the entire law? You testified just a moment ago that there are a million levels below this animal waste management plan ceiling. 04:21PM
A I keep using a million, don't I? 04:21PM
Q Yeah.
A It's a good number I guess.
Q At what point -- how do I know if I'm in operation and I've got this animal waste management plan, at what level of these million levels do I 04:21PM

know --

MR. LENNINGTON: Objection to form.

Q -- am I in violation of all of these laws and regulations?

A You can ensure that if you do the sampling. 04:22PM
You can go above and beyond all of these things, any of the basic requirements listed in your plan. You can do -- you can get additional education. You can get someone to come out from the extension to give you additional guidance. You can go to NRCS and ask 04:22PM
for additional guidance, I mean, beyond what they put together in their plan. All of these things are free services that are provided to farmers in virtually every county in the country. You can go -- you've got your soil test results. He looks 04:22PM
at those soil tests results. He sees that recommendation and says, hey, okay, that's another way I can maybe ensure because I know that's lower than this number, but I want to ensure that I'm in compliance and don't have any runoff. You put in 04:22PM
grass buffer strips, all of those kinds of things that you choose to do. I mean, you are talking about the quintessential farmer that wants to do everything perfectly, and he can do his own sampling and make adjustments if he wants to or he can work 04:23PM

with an entity to do his own sampling downstream -- above and down, and he'd have results that he could see if he's contributing and, I mean, that's just another tool that is available to him.

Q Okay. To do his own sampling? 04:23PM

A Yes.

Q Okay. Up and downstream?

A It's possible.

Q Okay. What does the State of Oklahoma do to verify or to determine whether an owner or operator 04:23PM of a poultry facility subject to the Registered Poultry Feeding Operations Act is in violation of this Paragraph 7C or any of these other provisions that you've specified?

A Our minimal starting point is look at the 04:23PM plan, look at their land application records, look at their soil test records, look at their litter analysis records.

Q Okay, and how can you tell whether there's runoff if you look at the animal waste management 04:24PM plan?

A Then you compare that to -- you compare that waste management plan to all the record keeping that they've done. As a whole, you do a site inspection. It's not something obviously that you can do just in 04:24PM

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, ex rel.
W.A. DREW EDMONDSON, in his capacity as
ATTORNEY GENERAL OF THE STATE OF
OKLAHOMA, and OKLAHOMA SECRETARY
OF THE ENVIRONMENT C. MILES TOLBERT,
in his capacity as the TRUSTEE FOR NATURAL
RESOURCES FOR THE STATE OF OKLAHOMA,

Plaintiffs,

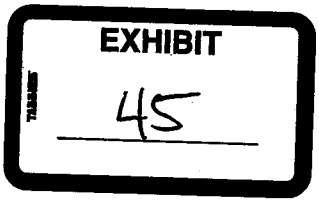
vs. No. 05-CV-0329 GFK-SAJ

TYSON FOODS, INC., TYSON POULTRY, INC.,
TYSON CHICKEN, INC., COBB-VANTRESS, INC.,
AVIAGEN, INC., CAL-MAINE FOODS, INC.,
CAL-MAINE FARMS, INC., CARGILL, INC.,
CARGILL TURKEY PRODUCTION, LLC,
GEORGE'S, INC., GEORGE'S FARMS, INC.,
PETERSON FARMS, INC., SIMMONS FOODS, INC.,
and WILLOW BROOK FOODS, INC.,

Defendants.

VIDEO DEPOSITION OF DANIEL JOSEPH PARRISH
TAKEN ON BEHALF OF THE DEFENDANTS
ON JANUARY 14, 2008, BEGINNING AT 9:37 A.M.
IN OKLAHOMA CITY, OKLAHOMA

Videographer: Stephanie Britton
Reported by: Lana L. Phillips, CSR, RPR



Plus two more sentences are there, about wetness, and mentions highly vulnerable groundwater again.

Q Okay. So for Mr. Saunders, I have -- in this animal waste management plan, I have some criteria that address all of my fields, that address areas near streams, ponds, water wells, and I have criteria here that address my steep sloping land, and to address my land that is seasonally wet.

I have something to refer to in this plan, as far as telling me how to handle my poultry waste related to those lands; correct?

A That is correct.

But it's only based upon this animal waste management plan document. There are more regulations than just the plan.

Q Under the statutory program, as well as the plan, the registered poultry feeding operators are required to maintain records of the disposition of the poultry waste generated on their farms; correct?

A Yes.

Q And if they land-apply it on their own land, they're supposed to record that;

A These plans provide guidance of how they should use their poultry waste, and then there are other guidance they should also refer to besides these plans.

Q But you agree that trained authorized personnel either for -- working for NRCS or working for ODAFF, have prepared a document that specifically tells them what the allowable rate of litter application is on any field upon which they intend to use poultry waste?

You agree?

A These documents tell that poultry operation the guidelines they should use in applying their waste. But just as me with my driver's license, it doesn't give me everything that I am required to do when I'm driving my car.

Q But you expect poultry growers to follow these animal waste management plans?

That's what the law says, doesn't it?

A Follow those waste management plans, to follow the Oklahoma water quality standards. I can give you a whole list of things that they have to -- in addition to that, that they have to

adhere to, just as I have to do with my driver's license.

Q Now, the regulated persons who are required to have animal waste management plans, those are the owners and operators of the registered feeding operations; correct?

A The law requires that the owners of a Oklahoma registered poultry feeding operation have an animal waste management plan or proof that they've applied for an animal waste management plan.

Q Has ODAFF ever required a poultry integrator to obtain an animal waste management plan?

A Yes.

Q Has ODAFF ever required a poultry integrator to obtain an animal waste management plan in the Illinois River watershed?

A I don't have memorized anybody that's a registered poultry operation in the Illinois River watershed would have to get that plan -- whether there are poultry integrators who have operations owned by them in the Illinois River watershed, I don't have that list memorized.

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, et al.,
Plaintiff,

vs. CASE NO. 05-CV-00329-GKF SAJ

TYSON FOODS, INC., et al.,
Defendants.

VIDEOTAPED DEPOSITION OF J.D. STRONG
TAKEN ON BEHALF OF THE DEFENDANTS
ON APRIL 9, 2009, BEGINNING AT 8:40 A.M.
IN OKLAHOMA CITY, OKLAHOMA

APPEARANCES:

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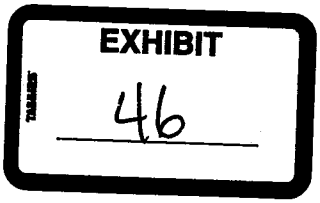
REPORTED BY: Laura L. Robertson, CSR, RPR



pollution, but the phosphorus that comes out of a bag from Home Depot that runs off into the stream is not pollution. Is that what you're telling me?

MR. LENNINGTON: Object to the form.

THE WITNESS: As far as the state law is concerned, that's true.

Q. (BY MR. TUCKER) Okay. Now, you have told me that a farmer can get a nutrient management plan and he can comply with that nutrient management plan and still be violating the law because there can be site specific runoff from his application of poultry litter; is that right? Is that what you told us? Did I get that right?

A. Yes, I believe so, yes.

Q. Now, what part of the nutrient management plan tells the farmer, makes that disclosure to the farmer, does any part of the plan tell him that?

A. I'm not familiar with every verse and word of the nutrient management plan, so I'm not sure if that is included in the nutrient management plan or not.

Q. Have you ever even looked at one?

A. I have glanced.

Q. Have you ever read one?

A. Not thoroughly.

right?

A. I don't know whether or not the farmers know it.

Q. Can do it, can comply?

A. It is possible to violate the laws of the state while complying with a nutrient management plan.

Q. And that's because some phosphorus can run off?

A. Correct.

Q. How much?

A. I think --

Q. How much phosphorus?

A. It is a very site specific number.

Q. An 80 acre tract of land that has litter applied to it, nutrient management plan says you can put on three acres a year -- three tons per acre per year. How much phosphorus runs off that land?

MR. LENNINGTON: Object to the form.

THE WITNESS: I don't know. That's just a general --

MR. TUCKER: How much phosphorus would have to run off that land to cross your threshold that would make it pollution?

A. The law says zero runoff.

Q. Does phosphorus run off just plain dirt,

A. They both get their root in a law, yes.

Q. Regardless of whether one is federal and one state?

A. One is state.

Q. But they are both created, the requirement is created by a law; correct?

A. Correct.

Q. Okay. And they both allow discharge into the environment within the state of Oklahoma of phosphorus; correct?

MR. LENNINGTON: Object to the form.

THE WITNESS: The point source permit does, yes.

Q. (BY MS. LONGWELL) Okay. And when an animal waste management plan says you can land apply a certain amount of poultry litter to the land, to a specific land, is that not a permission to apply a certain amount of phosphorus into the environment within the state of Oklahoma?

A. I think that requires some sort of legal interpretation, but I don't necessarily believe that it does.

Q. Do you agree with me that poultry litter contains phosphorus?

A. Yes.

PRODUCTION TECHNOLOGY

Department of Plant & Soil Sciences
Division of Agricultural Science & Natural Resources
Oklahoma State University

OSU
OKLAHOMA COOPERATIVE EXTENSION SERVICE

PT 98-1 January 1998

SCIENCE-BASED ANIMAL WASTE PHOSPHORUS MANAGEMENT FOR OKLAHOMA

G.V. Johnson, N.T. Basta, H.A. Zhang, J.A. Hattey, W.R. Raun, and J.H. Stiegler
Department of Plant and Soil Sciences

Executive Summary

Poultry and swine production has created both economic growth in Oklahoma and concern over the effect of excessive land application of animal manure on water quality. Along with economic benefits, producers are faced with disposal of large amounts of animal manure generated from poultry and swine production. Land application of animal manure increases soil P and has raised concerns about P runoff from agricultural land and environmental degradation of streams and lakes.

Several states have proposed standards that would limit manure applications and avoid excessive levels of soil P and reduce impact of P on water quality. Standards may be based on *nutrient utilization* where manure is applied to meet P required for crop production. Standards based on *waste disposal* exceed nutrient P crop requirement and allow for some buildup of soil P.

Several decades of scientific research has documented the relationship between soil P index, crop production, and water quality. Application of manures to soil at P levels required to produce crops minimizes impact on water quality. Science-based fertilizer recommendations used by Oklahoma State University, based on decades of field and laboratory research, show a soil test value of 65 is adequate for production of most crops. Recent research by soil scientists at Oklahoma State University shows that a field-average soil test of 120 can be used to ensure most areas of a field have sufficient P with soil test levels of 65+ and prevent any localized deficiencies due to soil variability. Therefore, *nutrient utilization* standards require that animal manure applications do not result in soil test levels that exceed 120. This will ensure adequate levels of P for crop production and minimize impact on water quality in Oklahoma. Adequate scientific information needed to set risk-based waste utilization standards for Oklahoma is not available at present.

Introduction.

Management of animal waste in Oklahoma has gained interest in recent years as a result of rapid increases in confined-animal waste production. Whether animal waste is considered a resource or not, depends on how it is managed and whether it can be beneficially utilized or is simply disposed of without benefit. Historically, animal wastes have been land-applied to agricultural fields as a beneficial input to crop production. Increased soil organic matter and increased plant available nutrients are recognized as the major benefits. Increasing soil organic matter changes several soil properties, directly and indirectly related to crop production. Therefore, the effect of increasing soil organic matter on crop production has been difficult to quantify. However, the relationship between increasing soil availability of plant nutrients and benefit to crop production has been a subject of widespread scientific inquiry for decades and is well documented. In the scientific processes of improving the understanding of soil availability of plant nutrients and crop response, much has been learned about the fundamental behavior of plant nutrients in the soil. This knowledge also provides a foundation for understanding how soil applied plant nutrients, from any source, might influence the environment.

General Soil-Nutrient Relationships.

The chemical and biological (soil microorganisms) activity of nitrogen (N), phosphorus (P), and potassium (K) in soils causes plant available N to move in the soil in response to water movement, while P and K do not, at concentrations required for

optimum plant growth. Soil immobility of P is a result of orthophosphate precipitation by calcium (Ca) in soils above about pH 5.5 and precipitation by aluminum (Al) and iron (Fe) below about pH 5.5. Nitrogen is mobile because most N is plant-absorbed as the non-precipitating nitrate (NO_3) form, the final oxidation state of organic- and ammonium (NH_4)- N. Consequently, N management for crop production is directly related to crop yield because the total inorganic N present can support plant growth. Management of available P and K is not directly related to crop yield because plants can only extract these immobile nutrients from a thin layer of soil surrounding the root. The total amount of inorganic P and K present is not as important as the concentration of these elements in the soil next to the root surface and the capacity of that soil to replenish P and K in the soil solution when it is removed by plant uptake. Soil tests have been developed to provide an index (Table 1) of the soil capacity to supply adequate amounts of these nutrients during the crop growing season. In addition to identifying the soil-P condition where deficiency is likely to exist (soil test index < 65), scientists also calibrated the soil test to identify probable yield (% sufficiency) when the deficiency exists, and the amount of fertilizer P_2O_5 required annually to correct the deficiency. The soil test P index (STP) is produced using the Mehlich III (M III) extraction procedure in Oklahoma. This method has gradually become a widely adopted technique for estimating plant available P.

Table 1. Calibration of Mehlich-III soil test P for wheat grain in Oklahoma.

P Soil Test Index*	Percent Sufficiency	P_2O_5 (lb/acre)**
0	25	80
10	45	60
20	80	40
40	90	20
65+	100	0

* Value is pp2m soil basis (same as lb/acre numerically).
** Fertilizer input.

Crop Response To Fertilizer-P.

Soil test calibrations, such as Table 1, were developed for Oklahoma and most of the other states more than 20 years ago and involved replicated fertilizer rate experiments on farmers' fields over broad geographic regions. Findings were similar, and current soil test calibrations do not differ markedly from one state to another when similar testing procedures and reporting units are used. Use of soil testing to identify deficiencies and continued annual application of fertilizer-P results in enrichment of plant-available soil-P. A long-term research experiment at the OSU Agricultural Experiment Station at Lahoma, Oklahoma documents the effect of soil-P depletion and enrichment from 27 years of annually applying 0 to 80 lb/acre fertilizer-P for annual winter wheat production (Figure 1). This research also documents the lack of wheat yield response to STP values above 65 (Figure 2).

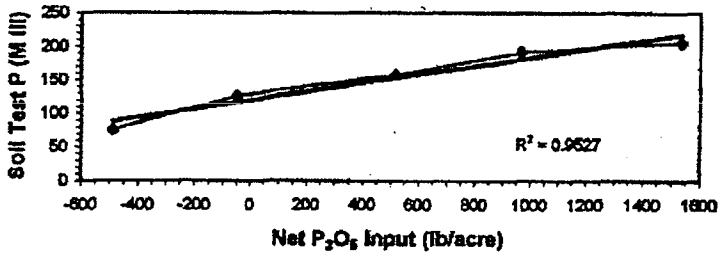


Figure 1. Change in soil test P (pp2m) resulting from 27 years of fertilizer-P input and wheat grain removal (Lahoma 502).

From Figure 1 it can be calculated that a net change of about 15 lb P_2O_5/acre is required to raise (fertilizer-P input) or lower (crop-P removal) the soil test P by a value of 1.0 for this Grant silt loam soil. It is possible to increase STP by simply adding P fertilizer, but Figure 2 shows higher yields do not result from P application when STP is greater than 65.

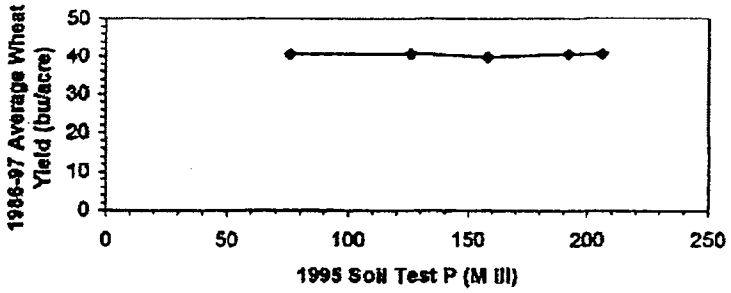


Figure 2. Lack of wheat grain response to soil test P values above 65.

Crops do respond, although slight, to relatively large inputs of fertilizer-P when soil tests are less than 65 as illustrated by Figure 3, showing alfalfa yields in relation to fertilizer-P in a current research study at the OSU Agricultural Experiment Station at Chickasha, Oklahoma. The initial soil test P level averaged about 30, but was quite variable for the site in 1992.

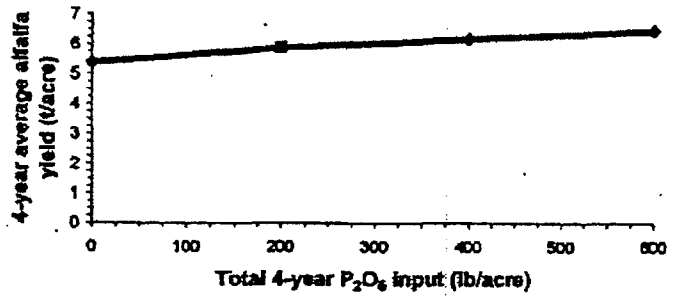


Figure 3. Alfalfa yield response to high rates of fertilizer-P in a P deficient soil (STP = 30) at Chickasha, Oklahoma.

Field Variability.
Recent research, evaluating soil test variability within fields, has identified that portions of a field should respond to fertilizer-P even when the composite soil test for the field is greater than 65. This results from the composite sample, composed of 12 to 15 core samples (0 to 6 inch depth), containing soil from some areas of the field that would be higher than 65 and some areas lower than 65. In order to obtain maximum yield for the entire field it would be necessary to fertilize the field even after the composite sample STP was 65. The STP value, for a composite sample from a variable field may need to be almost double the value of 65 to ensure all P-deficient areas of the field received enough fertilizer P to eliminate P deficiency in the field (Figure 4).

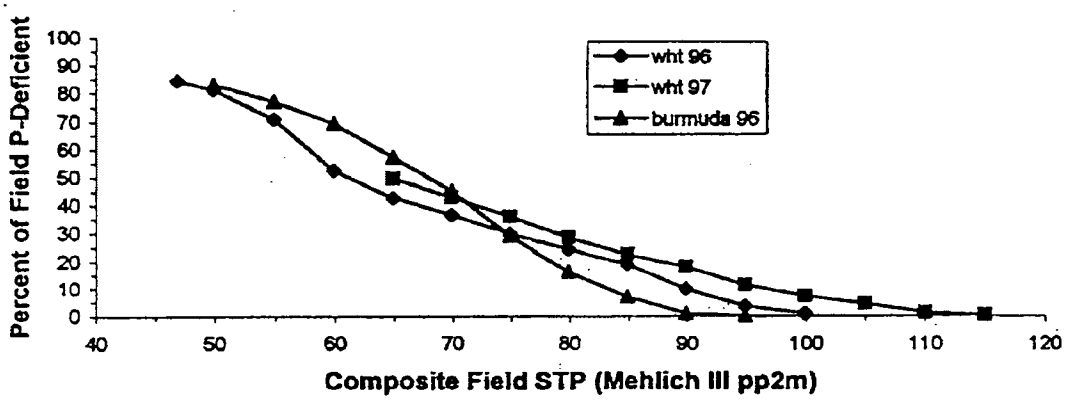


Figure 4. Projected percent of field that would be P-deficient when soil test P value is from a composite for a normally variable field. Field variability estimated from soil testing 250 to 500 areas of each field.

As the soil test P value from a composite field sample increases above 65 the amount of response to fertilizer P addition decreases and the effect of excess P increases when a constant rate of P is applied to the entire field.

Effect of Excess Soil-P.

One of the effects of increasing soil test P is that soil solution P also increases. This has been documented in the past as scientists evaluated forms of soil-P in relation to fertilizer addition and plant response. Recent analysis of samples, selected to represent a broad range of soil test P values for soils submitted to the OSU Soil, Water, and Forage Analytical Laboratory for routine analysis, showed the relationship existed over a wide range of soil test P (Figure 5). The calculated water soluble P at a soil test P value of 65 (regression equation, Figure 5) would be 0.057 ppm P, which is consistent with published values identifying the water soluble P level to support crop needs (Tisdale et al., 1993, p 180).

Since the concentration of water soluble P in soils increases as soil test P increases, it is reasonable to expect the risk to water quality from soluble P will also increase when soil test P increases. Manure application standards based on soil test P levels that exceed crop production needs have been proposed or adopted in several states.

Table 2. Critical levels of soil test P proposed to protect water quality from excessive levels of soil P buildup from manure application.

State	Soil Test Critical Value
Arkansas	150 mg kg^{-1} Mehlich 3 P
Delaware	120 mg kg^{-1} Mehlich 1 P
Michigan	75 mg kg^{-1} Bray 1 P
Ohio	150 mg kg^{-1} Bray 1 P
Oklahoma	130 mg kg^{-1} Mehlich 3 P
Texas	200 mg kg^{-1} Mehlich 3 P
Wisconsin	75 mg kg^{-1} Bray 1 P

Agreement between states on universal soil test critical levels has not been reached for several reasons. Some degree of environmental impact is likely from soils with test P that exceeds crop production levels. However, there is little scientific information that relates soil test P to a known environmental impact. Furthermore, a universal soil test critical level may not have any scientific basis because the environmental impact from soil test P will be watershed dependent. Use of soil test levels that exceed crop production levels require risk-based decisions. However, little data is available to support risk-based standards (Sharpley et al., 1996).

Management of Soil-P Inputs: Utilization vs disposal.

When management of P inputs to soils are considered, two clear outcomes are of concern with any strategy. First there is the traditional management of P inputs to improve crop production

related to the needs for food and feed. Input rates are usually small because of economics when commercial fertilizer is used. Second, there is the recent concern to manage P inputs to minimize risk to surface water quality. Guidelines for P inputs related to crop production are clearly defined by scientific work. When soil test P values are below 65, inputs of fertilizer-P according to soil test calibration are prudent for increased crop production. When fields are known to be variable, crop yields may be further increased by inputs of P until the composite soil test P value reaches about 120. When the soil test P value exceeds 120, there is no longer a benefit to crop production from P addition to the field.

When P inputs, in the form of animal waste-P, are managed with the interest of balancing the benefits of food production against risk to the environment, a STP value of 120 clearly differentiates utilization from disposal. Addition of animal waste to fields testing below 120 involves utilizing the waste for beneficial purposes. Addition of animal waste to fields testing above 120 involves disposal of the waste without benefit to crop production, but with increased risk to water quality by runoff and/or erosion.

As a final consideration, management of P in the form of animal waste or commercial fertilizer should be sensitive to the fact that P comes from natural, nonrenewable reserves of finite size. Current known US reserves of rock phosphate for fertilizer manufacturing have been estimated to be depleted in about 25 years at the current rate of consumption. Unless new reserves are found, recycling of P through the food-feed chain will become increasingly important.

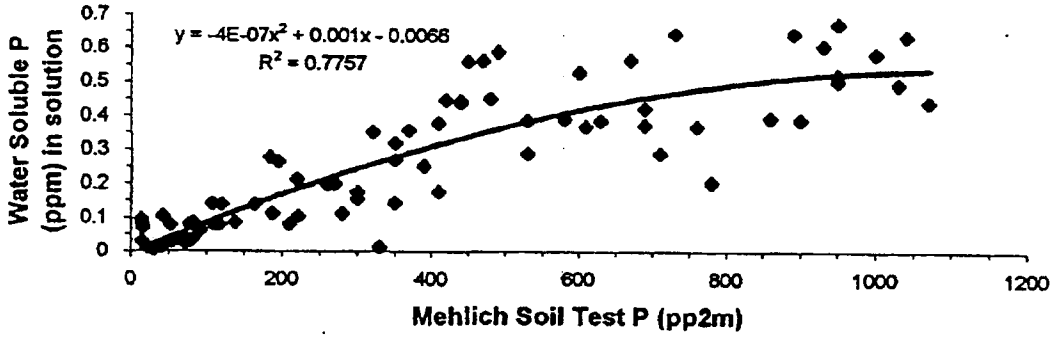


Figure 5. Relationship of soil test P and water soluble P (soil:solution ratio of 1:12.5) selected to represent a wide range of soil test values, from samples submitted to the OSU Soil, Water, and Forage Analytical Laboratory in 1997.

References.

Sharpley, A.N., T.C. Daniel, J.T. Sims, and D.H. Pote. 1996. Determining environmentally sound soil phosphorus levels. J. Soil and Water Cons. 51(2): 160-166.

Tisdale, S.L., W.L. Nelson, J.D. Beaton, and J.L. Havlin. 1993. Soil fertility and fertilizers. Fifth ed. Macmillan Publishing Company, New York.

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF OKLAHOMA

THE CITY OF TULSA, THE TULSA METROPOLITAN UTILITY AUTHORITY,

Plaintiffs,

vs.

TYSON FOODS, INC., COBB-VANTRESS, INC., PETERSON FARMS, INC., SIMMONS FOODS, INC., CARGILL, INC., GEORGE'S, INC., CITY OF DECATUR, ARKANSAS,

Defendants.

No. 01 CV 0900B(X)

VIDEOTAPED DEPOSITION OF

RONALD J. MULLIKIN

THE VIDEOTAPED DEPOSITION OF RONALD J. MULLIKIN, taken before Karen J. Eichmann, Certified Shorthand Reporter and Notary Public of the State of Iowa, commencing at 12:02 p.m., on the 18th day of July, 2002, at 421 West Broadway, Suite 405, Council Bluffs, Iowa.

EXHIBIT 5

Reported by: Karen J. Eichmann, C.S.R.

EXHIBIT 48

Q. Mr. Mullikin, would there -- would there be any reason to put any more phosphorus on a field than whatever the plant was -- that was being grown in the field could use in its uptake?

A. From an agronomic standpoint, there wouldn't. From a growing standpoint, there wouldn't.

Q. And from an environmental standpoint if one was in a watershed that was already sensitive to phosphorus because of years of phosphorus application and so forth, would there be any reason to put any more than the plant could uptake?

MS. BARTLEY: Object to form.

A. The -- the answer to that is there certainly wouldn't be, but the problem goes beyond that. For the grower himself that litter has always been a source of fertilizer, and most of the time it goes on pasture. And phosphate is not one of the elements that pasture ground needs in great numbers to thrive on. It needs nitrogen. And so it was a great source for the growers to be able to put nitrogen on their fields that it needed.

Q. And a side result of that was then too much phosphorus then got put on the fields?

MS. BARTLEY: Object to form.

A. That -- that's the end result.

Q. Is there any reason the company couldn't do something to correct that problem?

MS. BARTLEY: Object to form.

A. It is all about economics. The grower has their own fertilizer source being the litter; and because that is a source that is theirs, it doesn't cost them anything. To replace it with commercial fertilizer, it is a matter of economics.

Q. The commercial fertilizer could be mixed in such a way that it got the right amounts of the three elements that you mentioned; correct?

A. You could put straight nitrogen on it if you wanted to.

Q. Or any mixture, any combination of the three --

A. That's correct.

Q. -- for agronomic purposes?

A. That's correct.

Q. Is there any reason the poultry